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RESEARCH REPORT SERIES

Number 1

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SOCIO-ECONOMIC CHARACTERISTICS OF
LIVESTOCK RAISING IN NEPAL

Pradeep M. Tulachan

Editor:

Michael B. Wallace

HMG-USAID-GTZ-WINROCK PROJECT
STRENGTHENING INSTITUTIONAL CAPACITY IN THE
FOOD AND AGRICULTURAL SECTOR IN NEPAL

FOREWORD

This Research Report Series is funded through the project, "Strengthening Institutional Capacity in the Food and Agricultural Sector in Nepal," a cooperative effort by the Ministry of Agriculture-(MOA) of His Majesty's Government of Nepal and the Winrock International Institute for Agricultural Development. This project has been made possible by substantial financial support from the U.S. Agency for International Development (USAID) and the German Agency for Technical Cooperation (GTZ).

One of the most important activities of this project is funding for problem-oriented research by young professional staff of agricultural agencies of the MOA and related institutions. This research is carried out with the active professional assistance of the Winrock staff.

The purpose of this Research Report Series is to make the results of these research activities available to a larger audience, and to acquaint younger staff and students with advanced methods of research and statistical analysis. It is also hoped that publication of the Series will stimulate discussion among policy-makers and thereby assist in the formulation of policies which are suitable to the development of Nepal's agriculture.

The views expressed in this Research Report Series are those of the authors, and do not necessarily reflect the views of their respective parent institutions.

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PREFACE

This study was done jointly by the Ministry of Food and Agriculture (MFA) and the Agricultural Development Council (ADC) in 1979. Design and construction of the questionnaire were done by Mr. R.B. Singh (MFA), Dr. R. P. Yadav (APROSC), Dr. S. Ong (ADC), and Dr. V. Burger (ADC). Others included Mr. N.D. Joshi, Mr. K.R. Pande, and Mr. S.L. Pradhan from MFA. Mr. B. Charles, economist, and Mr. P. Alirol, ecologist-cum-anthropologist, helped in project formulation and design. Livestock specialist Mr. R.M. Upadhaya (MFA) coordinated the project. The Regional Directorate of Agriculture, Pokhara and the Gandaki Agricultural Development Project assigned ten JTs to collect field data. Dr. V. Burger, Mr. B. Charles and Mr. J. Von Burger helped in project field work.

Initial data analysis was done by Mr. Pradeep M. Tulachan, Lecturer, Department of Economics, Institute of Agriculture and Animal Science (IAAS), Rampur, and Dr. Pitamber Sharma, Tribhuvan University. Mr. Pradeep M. Tulachan did the final data analysis and report. Dr. Michael B. Wallace, Specialist, ADC, reviewed and helped revise the paper several times. Dr. Patricia Whittier, socio-economic anthropologist, Michigan State University, provided editorial assistance. Dr. Weslie Combs, Animal Science Advisor, IAAS/NUCIA Rampur, also reviewed the manuscript.

INTRODUCTION

Nepal is a country of small farmers where 90 percent of the people live in rural areas. Agriculture contributes over half the Gross Domestic Product (GDP). Livestock contributes one-seventh of the GDP as milk, ghee, meat, manure, and skin, and one-fourth of the agricultural GDP. Livestock is indispensable to most farm households, providing milk and milk products, meat, manure, and draft power as well as having social and religious utility.

In spite of livestock's significance, few studies have been done to understand village livestock systems. This lack of information has made it difficult for policy makers and researchers to set priorities for livestock development. Emphasis has been on the biological aspects of livestock production and socio-economic aspects have been overlooked. Fortunately, it is now well-recognized that understanding the socio-economic aspects of livestock production and village farming systems is necessary to formulate realistic policies and bring about development for Nepal's traditional farmers. Only with an understanding of what farmers do, and why and how they do it in their village livestock production systems can these systems be improved or new systems be introduced. This study attempts to describe existing village livestock production systems, emphasizing the socio-economic aspects, and to show how livestock production is related to other farming tasks.

The main objectives of this study are:

- a) analyze socio-economic variables affecting livestock holdings;
- b) describe existing livestock production systems;
- c) describe links between crop and livestock production systems;
- d) determine the importance of livestock to farmers' incomes;
- e) analyze the costs and returns of livestock production systems; and
- f) assess socio-economic and institutional constraints to increased village livestock production.

SURVEY METHODOLOGY

The selection of five village panchayat study areas was based on topographic and climatic conditions and on predominant livestock types. These village panchayats are:

Village	District/Zone	Livestock	Ward No.	Number of Households
Waling	Syangja/Gandaki	cattle/buffalo	3	31
Chilaunibas	Syangja/Gandaki	cattle/buffalo	3	30
Bhimad	Tanahu/Gandaki	goat	5	30
Gandruk	Kaski/Gandaki	sheep	5	32
Kobang	Mustang/Dhaulagiri	yak/nak	5 and 8	27

Waling and Chilaunibas were selected to assess the impact of markets on the production of cattle and buffalo. Waling is in a market area whereas Chilaunibas is about six miles away from the district headquarter market of Syangja. In each village panchayat one or two wards were selected for study on the basis of livestock types raised. Two questionnaires were developed after a brief exploratory survey and discussions with local villagers. One questionnaire was designed to collect general information about village panchayats and wards from the Pradhan Pancha or a respected senior villager. The second questionnaire was designed to collect information about individual households.

At least 30 households in each ward were interviewed. If a ward had only 30 households, all were interviewed. In larger wards every other household was interviewed. In Kobang no ward had more than 18 households so all households in two adjoining wards were interviewed. A total of 150 households from six wards were interviewed.

STUDY VILLAGE PANCHAYATS (Tables 1 and 2)

Waling lies in Syangja District at an altitude of 3500 ft. and covers about 7.5 sq.mi. The climate is sub-tropical. The Sunauli-Pokhara highway passes through this village, and a large linear bazaar has developed along the road. About 80 percent of the land is arable. Waling has the highest percent of irrigated land among study villages. Forests comprise about 18 percent of the area, and the remaining land is pastures and river beds. Forests and pastures are about half an hour's walk from the settlement. All villagers are Brahmin. Household size and literacy rate are the highest among the villages studied. As is typical in Brahmin villages, no farmers raise poultry or pigs.

Chilaunibas lies on the northwestern edge of Syangja district at an altitude of 4500 ft. and covers about 8 sq.mi. The nearest motorable road, the Sunauli-Pokhara highway, is three hours' walk to the east. Climatic conditions range from sub-tropical to temperate. This panchayat has relatively intense land use with many terraced slopes. In the study ward, 97 percent of the land is either cultivated or settled, 1.4 percent is pasture land, and the remainder is waste land. Pastures are about 15-20 minutes walk from the settlement. Most of the villagers are Brahmins, and there are a few Sudras. Both household size and literacy rate are the second highest of the study villages. The average farm size is the lowest among the study villages.

Bhimad is 30 minutes' walk from Khaireni bazaar on the Prithvi Rajmarga. It covers 1430 ropanis (0.28 sq.mi.) of which only 48 percent is cultivated. About 21 percent of the cultivated area is irrigated lowland. Of the villagers, 74 percent are of the Damai, Kami, and Sarki occupational castes. Average farm size and literacy rate are second lowest among the villages studied. The villagers raise the most poultry and the second largest number of small animals of the study villages.

Gandruk is a hill village in northern Kaski District, a two-day walk from Pokhara. The area is mostly mountainous with a temperate climate. It has the most cultivated land per household of the study villages. No information was available on forest and pasture land. Gandruk is a popular destination for tourists trekking from Pokhara. Gurungs (Vaisya) predominate, and Sudras are the second largest group. There are a few Magars but no Brahmins or Chhetris. The villagers raise the most small animals and have the largest farms of the study villages.

Kobang lies on the west side of the Kali Gandaki River in Mustang District. It is on the main trekking route from Pokhara to Jomsom about four days' walk from Pokhara. It has the second highest average amount of cultivated land per farm family. Thakali (Vaisya) are 93 percent of the population and the rest belong to the Sudra occupational castes. Both household size and literacy rate are the lowest of the study villages. The number of large animals raised is the highest of all study villages but this statistic is skewed by a few rich farmers who own large yak herds. No small animals are raised in the study area.

Table 1. Socio-Economic Characteristics of Study Villages

	Waling	Chilaunibas	Bhimad	Gandruk	Kobang
Family size (number)	3.0	6.5	6.0	5.8	3.9
Age of household head (years)	44	47	46	50	48
Literate farmers (percent)	77	63	20	38	15
Caste composition (percent)					
Brahmin	100	40	10	-	-
Chhetri	-	27	10	-	-
Vaisya	-	17	6	60	93
Sudra	-	16	74	40	8
Average farm size (ropani)	13.9	9.8	10.8	20.3	14.7
Livestock holdings (number)					
Large animal	7.5	4.2	4.3	5.0	8.1
Small animal	0.4	2.0	2.5	9.9	-
Poultry	-	1.2	9.1	5.7	3.4

Table 2. Land Holdings (Household Average, Ropanis)

	Waling	Chilaunibas	Bhimad	Gandruk	Kobang
Khet (lowland) Irrigated	6.0	3.4	2.2	1.5	-
Unirrigated	1.4	1.7	0.7	5.4	-
Pakho (upland) Irrigated	-	0.5	-	-	1.4
Unirrigated	6.6	5.0	7.9	13.4	13.2
Total	14.0	10.0	10.8	20.3	14.6
Percent irrigated land	43	37	20	7	10
Number of parcels	4.7	NA	4.0	6.0	6.7

LIVESTOCK HOLDINGS BY SPECIES (Table 3)

Cattle are raised in all the villages, buffalo and goats are raised in all except Kobang, and poultry are raised in all except Waling. Sheep and pigs are each raised in two villages, and yak/naks are raised only in Kobang. Household cattle and buffalo holdings are highest in Waling, goat and sheep holdings are highest in Gandruk, and poultry holdings are highest in Bhimad. In all study areas female buffalo outnumber male buffalo, which are usually marketed for meat. Male cattle (bullocks) are mainly used for draft power. The environment is the key factor in raising sheep in Gandruk and yak/naks in Kobang.

Table 3. Livestock Holdings by Species

<u>Waling</u>	Cattle	Buffalo	Goat	Sheep	Pig	Poultry
Adult Male	1.2	0.1	0.1	-	-	-
Female	1.4	2.1	-	-	-	-
Young Male*	0.7	0.2	0.1	-	-	-
Female	0.7	1.1	0.2	-	-	-
Total	4.0	3.5	0.4	-	-	-
Percent**	74	100	10	-	-	-
Range	0-11	1-7	0-6	-	-	-
<u>Chilaunibas</u>						
Adult Male	0.8	-	0.1	0.1	-	0.1
Female	0.4	1.5	0.2	0.3	-	0.5
Young Male	0.1	-	0.1	0.2	-	0.1
Female	0.4	0.9	0.5	0.5	-	0.5
Total	1.7	2.4	0.9	1.1	-	1.2
Percent	60	93	33	10	3	-
Range	0-10	1-6	0-12	0-5	0-3	0-8
<u>Bhimad</u>						
Adult Male	0.7	-	0.2	-	-	-
Female	0.8	1.3	0.5	-	0.1	2.2
Young Male	0.2	-	0.4	-	0.1	0.3
Female	0.5	0.8	1.1	-	0.1	6.6
Total	2.2	2.1	2.2	-	0.3	9.6
Percent	7	83	53	-	23	84
Range	0-12	0-6	0-10	-	0-1	0-23
<u>Gandruk</u>						
Adult Male	0.8	0.1	0.4	0.2	-	0.1
Female	1.1	1.6	2.3	4.5	-	0.9
Young Male	0.1	0.3	0.3	0.3	-	1.6
Female	0.5	0.6	0.8	1.2	-	1.9
Total	2.5	2.6	3.8	6.2	-	5.5
Percent	3	78	25	25	-	84
Range	0-21	0-12	0-23	0-64	-	0-30
<u>Kobang</u>						
Adult Male	0.9	-	-	-	0.6	0.3
Female	1.1	-	-	-	2.4	1.9
Young Male	0.8	-	-	-	0.3	0.4
Female	1.0	-	-	-	1.0	1.8
Total	3.8	-	-	-	4.3	3.5
Percent	63	-	-	-	6	2
Range	0-6	-	-	-	0-35	0-21

*Cattle, buffalo, yak/nak young up to three years; sheep, goat, pig up to two; poultry up to six months. **Percent farmers with livestock.

SOCIO-ECONOMIC CHARACTERISTICS AND LIVESTOCK HOLDINGS (Tables 4-8)

Livestock holdings are influenced by religious, economic and environmental factors (see Table 4). No Brahmins in the study areas raise pigs or poultry because these animals are considered unclean and unfit for consumption. Brahmins own more cattle per household than any other caste or ethnic group. Brahmins and Chhetries both own more buffalo than the occupational castes (Damais, Kamis, Sunars, and Sarkis), but these occupational groups own more pigs and poultry. In Gandruk, Gurungs raise some buffalo and cattle, but have many more goats and sheep. In Kobang, Thakalis raise mostly yak/naks. In Gandruk and Kobang environmental conditions influence the types of livestock raised.

In an agricultural society wealth is often held in the form of land and livestock, and thus a strong positive correlation between farm size and livestock holdings is likely. Wealth and education are usually correlated, and thus it is likely that there will be a positive correlation between education and livestock holdings (see Table 5).

Positive correlations between the number of cattle and buffalo per household and farm size were found for Waling, Chilaunibas, and Bhimad, along with strong positive correlations of livestock holdings and household size for Waling and Bhimad (Tables 6 and 7). In Waling goats are found only on medium large and large farms. In Chilaunibas medium and medium large farms have cattle, and only small and medium farmers raise sheep and poultry. In Gandruk, medium large and large farms have the most sheep. In Kobang, large farms own more cattle and chouris.

There are social and religious reasons for keeping livestock. In Hindu Nepal, cattle are sacred. During Dashara (Dasain), the great Hindu festival, cows are worshipped. In other religious ceremonies, people give cows to Brahmins. Brahmins and Chhetris sacrifice goats on many religious occasions, and Vaisya and Sudra raise poultry for sacrifices. The pig has no religious use and is considered unclean by Brahmins.

Apart from social and religious considerations, there are economic reasons for raising livestock. Cows are raised mainly to produce bullocks for draft power and secondarily for milk, manure, and leather. Female buffalo are raised mainly for milk, but they also produce manure. Male buffalo are used for meat and leather as well as for draft power and manure. In the study area, male buffalo are usually sold for meat as soon as they reach marketable age.

Some female goats are raised for milk, but more are raised for their reproductive capability. Goats are prolific breeders, and farmers can derive cash income from selling young stock. They also produce manure, and some goats produce fine quality fibre. In northern Mustang District goats are also used to transport goods.

Sheep are raised mostly for wool. They are also used for meat, and they produce manure. Pigs are raised mainly for meat. Poultry is raised for eggs, meat, and manure. Naks (females) are mainly raised for butter and yaks (males) for meat. Yaks are used for transportation during the winter in the northern high altitude regions of Kobang.

Table 4. Livestock Holdings by Caste

Livestock	Waling				Chilaunibas				Bhimad				Gandruk		Kobang
	a	a	b	d	a	b	c	d	c	d	c	d	c		
Cattle	4.1	3.4	1.1	0.2	7.0	5.7	0.8	1.3	2.8	1.8	4.1				
Buffalo	3.4	2.8	3.0	0.8	3.0	3.7	1.0	2.0	3.2	1.2	-				
Goat	0.4	1.2	1.3	0.4	6.7	3.7	0.8	1.7	6.2	-	-				
Sheep	-	0.7	-	-	-	-	-	-	9.0	-	-				
Pig	-	-	-	0.2	-	0.3	-	-	-	-	-		0.2		
Yak/Nak	-	-	-	-	-	-	-	-	-	-	-		6.4		
Poultry	-	-	2.3	1.6	-	24.7	4.0	9.2	7.4	1.1	3.4				

a = Brahmin; b = Chhetri; c = Vaisya; d = Sudra.

Table 5. Livestock Holdings and Education

Education	Waling			Chilaunibas			Bhimad			Gandruk			Kobang		
	LR	SR	P	LR	SR	P	LR	SR	P	LR	SR	P	LR	SR	P
8-10 yrs	8.6	-	3.3	1.4	0.5	13.0	-	-	5.7	25.2	8.3	-	-	-	
Literate	6.2	0.3	4.5	2.6	1.1	8.4	2.0	10.2	8.5	8.0	9.5	14.9	-	3.9	
Illiterate	4.0	-	3.8	2.7	0.8	2.9	2.0	10.6	3.9	5.8	4.4	10.3	0.3	0.3	

LR = Large Ruminants (cattle, buffalo, yak/nak); SR = Small Ruminants (goat, sheep, pig); P = Poultry.

Table 6. Livestock Holdings by Farm Size

Livestock	Waling				Chilaunibas				Bhimad				Gandruk				Kobang			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Cattle	1.1	5.3	4.2	9.0	-	1.0	3.0	7.0	0.6	2.4	4.3	7.0	-	1.8	2.0	4.5	0.4	3.4	6.4	6.8
Buffalo	2.3	3.7	3.2	4.5	1.1	2.3	3.1	3.0	1.2	2.6	3.1	5.0	1.0	3.0	2.5	3.9	-	-	-	-
Goat	-	-	0.3	1.5	1.0	0.2	1.9	2.0	0.9	4.0	2.3	8.5	-	4.6	4.6	6.4	-	-	-	-
Sheep	-	-	-	-	-	1.6	1.1	-	-	-	-	-	-	12.4	2.5	9.9	-	-	-	-
Pig	-	-	-	-	0.1	-	-	-	0.2	0.4	0.1	0.5	-	-	-	-	-	-	-	-
Yak/Nak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	6.2	13.7
Poultry	-	-	-	-	1.7	1.6	-	-	7.5	11.4	1.7	20.5	0.8	7.0	9.8	7.8	1.2	3.8	5.2	5.2

1=Small farm (0-6 ropanis); 2=Medium (6.1-14 ropanis); 3=Medium large (14.1-28 ropanis); 4=Large (over 28 ropanis).

Table 7. Livestock Holdings by Family Size

Livestock	Waling				Chilaunibas				Bhimad				Gandruk				Kobang			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Cattle	-	0.6	3.8	5.1	0.3	1.6	1.1	2.3	-	1.7	2.0	4.2	3.8	1.7	1.3	4.4	2.8	3.9	4.0	9.0
Buffalo	-	2.6	2.8	4.0	1.8	2.0	1.3	3.2	1.0	1.4	1.8	3.1	1.8	2.2	2.4	4.1	-	-	-	-
Goat	-	0.4	0.3	0.4	-	1.6	1.3	1.0	0.1	1.4	1.8	4.1	3.8	1.8	10.4	4.0	-	-	-	-
Sheep	-	-	-	-	-	-	-	2.8	-	-	-	-	3.6	1.9	14.0	7.1	-	-	-	-
Pig	-	-	-	-	-	-	-	-	0.1	0.3	0.2	0.3	-	-	-	-	-	-	-	-
Yak/Nak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	8.6	1.5	34.0
Poultry	-	-	-	-	2.3	1.6	-	1.8	8.7	6.6	10.2	12.9	11.2	2.8	6.0	8.6	2.9	3.0	5.0	4.0

1=Small family (1-3 family members); 2=Medium (4-5 members); 3=Medium large (6-7 members); 4=Large (8 or more members).

Kobang. Local cattle in Kobang, Lulu, are a dwarf variety adapted to the agro-climatic conditions of Mustang. Grazing practices in Kobang differ from other study areas. During the busy months from Chaitra to Asad villagers have a cooperative system. Each day two people from different households are assigned to graze all the villagers' animals. The animals are grazed for about seven hours a day, more than in other months. From Asad to Aswin all non-lactating animals are taken to a high altitude pasture (lekh) and left unattended to graze. From Srawan to Aswin all cattle from Kobang are taken by the farmers of neighboring Nupsang village who graze them in return for their manure. During the first two weeks of Kartik, all animals are grazed again on a cooperative basis as above. During the last two weeks of Kartik, animals are left loose for free grazing. From Magh to Falgun animals are grazed by their individual owners as farmers are free from other jobs. When green grass is scarce, cattle are fed straw or dry hay. They are fed salt monthly or fortnightly. Milking cows and working bullocks are fed 'kudo'.

Yaks (Bos gruniers, males) and naks (females) are large, hardy high-altitude animals found in the northern alpine areas of Nepal. They are raised transhumant in high altitude pastures (lekh) shifting from one pasture to another for grazing. Summer pastures are near the Himalayas and winter pastures are lower. In winter grasses are scarce and animals may go hungry when pastures are covered with snow. When there is heavy snow they are brought to fallow village fields until the snow melts. The animals graze in summer pastures from the end of Falgun through Bhadra. In Bhadra or Kartik they are brought to the village and fed a mixture of oil, eggs and local wine through a bamboo pipe, and then they are taken to winter pastures. During Asad, they are fed this mixture in high pastures where they are kept. Yaks are raised primarily for meat, and naks are raised for milk to produce butter. Thakalis sell live animals to Bhotiyas for meat. Nak butter is used mainly for preparing Tibetan tea, which is taken twice a day in large quantities. Butter is also used for cooking, and some people use it for massage.

Local chickens are raised in Kobang. The meat and eggs are mostly for home consumption. They scavenge and are fed household wastes and low-quality grains.

FEED AND FODDER PRODUCTION (Tables 8-11)

The distribution and availability of fodder trees is indicated in Table 8. Trees have long been a source of fodder for livestock and firewood for people. Growing human and livestock populations, lack of management, and overuse have led to deterioration of the forests and the hill environment. However, there are still some fodder trees in forested lands and some farmers in the study areas grow fodder trees.

Waling villagers grow fodder trees around farm households, on privately owned steep wasteland, and on field bunds. There is no information about varieties in forests and on communal land. Almost all households grow Gidagi and Gerula. Most Chilaunibas farmers grow Kabro. Pakhuri and Dabdabe are planted by half the Bhimad farmers, and almost half grow Khanayo. In Gandruk no farmers reported raising fodder trees, but many grow on common land and in forests, including Phyat, Kopila, Beres. Dudhilo, Thyanu, Kadapat, Ningalo, Khuletro, and Gerula. No information was collected on fodder trees in Kobang.

Table 8. Fodder Trees*

Trees	Waling				Chilaunibas				Bhimad			
	1	2	3	4	1	2	3	4	1	2	3	4
Tote	70	6.8	1.2	A,K,M,P,Mg,F	-	-	-	-	-	-	-	-
Gidagi	94	6.7	2.7	K,M,P,Mg,F	-	-	-	-	10	0.4	4.5	-
Berula	39	3.4	0.9	K,M,P,Mg,F	10	1.2	1.1	M,P,Mg	-	-	-	-
Chiple	26	0.7	0.8	Mg,F	-	-	-	-	-	-	-	-
Kutmiro	51	1.6	1.8	P,Mg,F	-	-	-	-	33	1.2	2.1	K,M,F
Badahar	58	0.3	0.7	Mg,F	50	1.6	1.6	Mg,F	-	-	-	-
Ramsing (Dabdabe)	74	6.7	1.9	A,K,M	40	1.1	1.3	P,Mg,F C,B,J	50	11.3	3.6	K,M,P
Khanayo	51	2.1	2.1	A,K,M	55	2.7	0.9	Mg,F	40	3.4	1.7	K,M,P
Pakhuri	19	0.7	5.2	F,C,B	45	1.8	1.1	C,B,J	50	1.0	4.3	C,B,J
Kabro	68	5.8	3.1	C,B,J	90	7.7	1.4	C,B,J	46	1.0	2.6	C,B,J
Koiralo	51	3.4	2.2	K,M,P,Mg,F	-	-	-	-	-	-	-	-
Barhar	22	0.8	4.3	Mg,F,C	-	-	-	-	-	-	-	-
Gerula	91	0.6	0.4	F,C	-	-	-	-	-	-	-	-
Aankha- pakuwa	-	-	-	-	43	1.7	0.3	Mg,F,C B,J	-	-	-	-
Kuhulo	-	-	-	-	6	0.1	2.7	C,B	-	-	-	-
Chiniya	-	-	-	-	-	-	-	-	23	0.5	4.5	K,M
Dhungre	-	-	-	-	-	-	-	-	20	0.3	1.9	C,B
Barro	-	-	-	-	-	-	-	-	7	0.3	5.6	F,Mg

1. Percent of farmers with trees. 2. Average number of trees per household. 3. Average fodder collected per tree (bharis) 4. Nepalese months when cuttings are done. *Scientific names are in Appendix 1.

No modern techniques for preserving dry fodder are used in the study areas. After harvest, crop straw and stalks are piled in open or dry places. Production is directly related to cultivated acreage. Paddy straw contributes the most, and maize stover is second in all villages except Bhimad (Table 9). Waling produces the most dry fodder per household, about three times that of Bhimad and Gandruk. Rice is not grown in Kobang, but buckwheat and barley are used for fodder.

Farmers save dry fodder to feed large livestock during the winter. Dry fodder production is minimal and would last only a few months if fed on a regular basis. Even in Waling, where production is greatest, if dry fodder or straw were fed at a rate of one-quarter bhari per animal per day, it would last only 72 days. At the same rate, the dry fodder production of Chilaunibas would last 46 days; in Bhimad, 29 days; in Gandruk, 31 days; and in Kobang, 51 days. Even if dry fodder is used only in winter, most animals remain underfed during the winter months.

Information about green grass, fodder grass and bedding materials is in Table 10. Green grass is collected from forests, wastelands, private land, and other public land. In Waling private land is the main source of grass. In Chilaunibas, grass collection from Asad to Marga is mostly from private land and from Poush to Jestha it is mostly from forest land. In Bhimad grass collection from private land is maximum in the first two quarters and later it is from forests. In Gandruk and Kobang forest land is the main source of green grass. During the rainy season (Asad to Asoj) green grass can be collected nearby. After that more time is needed because farmers must go to distant forests.

Table 9. Annual Production of Dry Straw per Household (Bharis)

Types	Waling	Chilaunibas	Bhimad	Gandrak	Kobang
Paddy Straw	71.3 (53)	33.6 (46)	14.5 (46)	12.3 (31)	-
Wheat Straw	13.0 (10)	5.8 (8)	0.5 (2)	1.9 (5)	8.6 (18)
Maize Stover	13.0 (22)	17.6 (24)	3.6 (11)	12.1 (31)	14.1 (29)
Millet Straw	21.1 (15)	12.7 (17)	12.3 (39)	9.8 (25)	-
Buckwheat/Barley	-	-	-	-	25.6 (53)
Other	-	3.7 (5)	0.5 (2)	3.0 (8)	-
Total	135.4(100)	73.4(100)	31.4(100)	39.1(100)	48.3(100)

Figures in parentheses are percentages.

Table 10. Green Grass, Fodder Grass, and Bedding Materials

Average collection per household per day (bharis)
 Asad-Bhadra Aswin-Marga Poush-Falgun Chaitra-Jestha

	Asad-Bhadra	Aswin-Marga	Poush-Falgun	Chaitra-Jestha
<u>Waling</u>				
Green grass				
-forests	0.4 (15)	0.4 (20)	0.2 (15)	0.1 (80)
-own land	2.0 (77)	1.3 (65)	0.9 (69)	0.6 (46)
-other (public land)	0.1 (80)	0.3 (15)	0.2 (16)	0.6 (46)
Fodder grass	0.1	0.4	0.2	0.2
Bedding materials	0.6	0.3	0.2	0.1
<u>Chilaunibas</u>				
Green grass				
-forests	0.6 (21)	0.1 (6)	0.3 (60)	0.4 (67)
-own land	2.0 (72)	1.5 (88)	0.1 (40)	0.1 (17)
-other (public land)	0.2 (7)	0.1 (6)	0.1 (40)	0.1 (16)
Fodder grass	0.2	0.3	0.5	-
Bedding materials	0.8	0.7	0.2	0.2
<u>Bhimad</u>				
Green grass				
-forests	0.2 (13)	0.9 (69)	1.0 (83)	1.0 (67)
-own land	1.4 (87)	0.4 (31)	0.2 (17)	0.5 (33)
-other (public land)	-	-	-	-
Fodder grass	0.1	0.1	0.1	0.3
Bedding materials	0.1	0.3	0.3	0.3
<u>Gandrak</u>				
Green grass				
-forests	0.8 (50)	0.9 (64)	0.1 (14)	0.5 (83)
-own land	0.2 (13)	0.1 (70)	0.6 (86)	0.1 (17)
-other (public land)	0.6 (37)	0.4 (29)	-	-
Fodder grass	0.2	0.2	0.6	0.4
Bedding materials	0.2	0.2	0.2	0.1
<u>Kobang</u>				
Green grass				
-forests	0.5 (56)	0.4 (100)	-	-
-own land	0.4 (44)	-	-	-
-other (public land)	-	-	-	0.2 (100)
Fodder grass	-	-	-	-
Bedding materials	-	1.2	1.2	0.3

Parentheses show percentages of green grass collected.

LABOR FOR LIVESTOCK RAISING (Table 11)

Table 11 shows the hours spent per day for livestock maintenance. Unfortunately, data are not available on distances to collection places or on seasonal variations. Time spent for green grass and fodder grass collection in Bhimad is the highest of the study areas followed by Waling. Bedding materials are collected from forests, but this is not done regularly so the time spent collecting bedding materials is less. Except in Kobang, collection of fodder grass and bedding materials is fairly constant throughout the year--about one half bhari a day.

Grazing. Grazing time varies with the season, and monsoon rain and winter cold sometimes preclude grazing. Highest average grazing hours are in Waling, followed by Bhimad; lowest are in Chilaunibas. Children and elderly people generally graze the animals.

Home Management. Women generally do the household work involved in livestock raising--feeding, cleaning sheds, preparing kudo, and milking. The most time is spent in Waling, and the least in Gandruk. Waling villagers have more large animals per household than other study areas. In Gandruk time is spent on sheep and goats raised on alpine pastures.

Time spent on livestock-related tasks at home is primarily a function of the number of large animals. In each village at least one man-day (eight working hours) per day is required to maintain livestock, but no household member does this full-time. Except for grazing, this work is done partly in the early morning and partly in the evening.

Table 11. Labor for Livestock Raising (hours/day)

Activities	Waling	Chilaunibas	Bhimad	Gandruk	Kobang
I At home					
a) Feeding dry and green Fodder	2.1	1.0	1.2	0.6	0.4
b) Preparing 'kudo' Concentrate	1.4	0.6	1.3	0.4	1.7
c) Cleaning sheds (goths)	1.1	0.3	1.7	0.2	1.6
Sub Total	4.6	1.9	4.1	1.2	3.7
II Outside home					
a) Collecting green grass	1.5	1.3	2.1	3.0	1.8
b) Collecting fodder from own land	1.3	0.5	1.0	-	-
c) Collecting fodder from forest	1.2	1.4	2.8	3.8	0.6
d) Collecting bedding from forest	1.5	0.4	0.9	0.7	1.9
Sub Total	5.5	3.5	6.9	6.8	4.2
III Grazing hours/animal	3.3	1.1	2.8	1.7	2.3
Total hours/day/household	13.3	6.6	13.8	6.7	10.2

LIVESTOCK PRODUCTION AND USE (Tables 12 and 13)

Milk and ghee production and consumption. Milk and milk products (ghee, butter, and curd) are the main source of income from cattle and buffalo. Milk production in the study areas is highest during Asad-Bhadra, and lowest during Chaitra-Jestha.

Milk production from cows in Waling, Chilaunibas, Bhimad, and Gandruk, where all cows are local breeds, is insignificant compared with buffalo milk production. In Kobang where yak/naks are raised on high pastures, milk is not available for domestic use. Local cows (Lulu) are milked for home consumption but average production is low.

The study village in Waling is close to Waling Bazaar, and about one-third of the liquid milk production is sold. The rest is consumed at home or used for ghee. There is no market for liquid milk sale in other villages. Milk is either used for ghee or for home consumption.

In Waling little milk is used for ghee production compared with Chilaunibas where ghee is the only milk product sold. In Bhimad and Gandruk, half the milk is used for ghee. In Chilaunibas and Gandruk most ghee is sold. Almost all the nak milk in Kobang is used to make butter.

Meat and wool production. Because there is no commercial meat market in the study areas, it is difficult to collect reliable data on meat production. Farm households generally slaughter and consume their own animals for festivals, religious ceremonies, and marriages. Brahmins are very particular about meat consumption and eat mainly goat. Chhetries usually only eat goat, but some eat poultry. Vaisya (Gurungs in this study) generally eat goat, sheep, pig, buffalo, chouri, and poultry although there are some Vaisya (Thakali) who do not eat pig, buffalo, and chouri. Sudra (occupational castes) eat all kinds of meat.

Two cuttings of wool per year are done from mature sheep. The large sheep population in Gandruk produces considerable wool. Wool is used to make Namlo, Radi, and Pakhi. Unfortunately no information was collected on the amount of wool production.

Table 12. Milk Production and Consumption (manas per household per day)

	Waling				Chilaunibas				Bhimad				Gandruk				Kobang‡			
	A/B	A/M	P/F	C/J	A/B	A/M	P/F	C/J	A/B	A/M	P/F	C/J	A/B	A/M	P/F	C/J	A/B	A/M	P/F	C/J
Milk animals	0.9	1.3	1.7	1.4	0.9	1.2	1.1	0.8	0.6	0.6	0.5	0.5	0.7	0.5	0.7	0.5	1.4	1.1	0.8	1.1
Production per animal	6.5	4.6	3.1	3.4	8.3	3.8	2.7	1.8	3.0	2.8	1.5	1.8	3.9	2.7	1.9	1.8	3.7	2.3	-	1.1
																	<u>2.0</u>	<u>1.7</u>	<u>1.4</u>	<u>0.8</u>
Production/household	4.6	6.1	5.2	3.3	7.2	4.4	3.0	1.4	1.2	1.7	0.8	0.7	2.7	1.9	1.0	0.9	3.8	2.4	-	1.2
Consumption	1.3	1.7	1.7	1.3	1.0	2.2	1.0	1.0	1.0	1.0	0.6	0.5	1.3	1.3	0.6	0.8	0.4	0.3	-	0.2
Milk for ghee	1.5	2.6	2.0	0.8	6.2	2.2	2.0	0.4	0.2	0.7	0.2	0.2	1.4	0.6	0.4	0.1	3.4	2.1	-	1.0
Milk sale	1.8	1.8	1.5	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Milk production/household	9.2	12.8	11.2	3.3	7.6	14.5	11.6	3.3	-	-	-	-	4.3	1.7	0.6	0.4	7.4	5.5	-	2.1
Domestic consumption	7.6	11.6	7.6	3.3	3.3	7.5	3.3	1.2	-	-	-	-	1.9	0.8	0.2	0.1	3.8	3.5	-	2.0
Ghee sales (manas)	1.6	1.2	3.6	-	4.3	7.0	8.1	2.1	-	-	-	-	2.4	0.9	0.6	0.3	3.6	2.0	-	1.0

‡ Nak milk production; Lulu milk production underlined;

A/B=Asad-Bhadra; A/M=Aswin-Marga; P/F=Poush-Falgun; C/J=Chaitra-Jestha.

Egg production. Because all the villagers in Waling are Brahmins, no poultry is raised there. Among the other areas, Kobang has the most poultry and Chilaunibas the least. The number of eggs produced per layer is highest in Kobang and lowest in Chilaunibas. Farmers in Chilaunibas and Bhimad keep more eggs for hatching than for sale and consumption. The average hatching percentage is low.

 Table 13. Egg Production and Use

	Waling	Chilaunibas	Bhimad	Gandruk	Kobang
Hens	-	1.0	1.8	2.3	2.6
Layers	-	0.6	1.6	1.3	1.8
Egg production/layer/year	-	20.0	31.6	34.8	44.3
Egg production/household/year	-	12.0	50.6	44.9	79.7
Egg consumption/household	-	1.3	5.5	18.4	35.7
Eggs sales/household/year	-	4.4	19.1	12.5	32.8
Eggs used for hatching/layer	-	7.3	26.0	14.6	11.2
Chicks produced (hatched)	-	2.9	13.5	8.9	NA

 ANIMAL POWER (Tables 14, 15, and 16)

Nearly three-quarters of the farmers in Waling and over half of the farmers in Chilaunibas own bullocks. Average working hours per bullock are highest from Falgun through Srawan. From Falgun to Baisakh farmers plant maize--early maize in the lowland and late maize in the upland. The heaviest work for bullocks is in Asad when land is prepared for paddy transplanting. During the paddy growing season (Bhadra through Kartik) bullocks remain idle. Work increases in Mangsir when bullocks are used to thresh paddy and to prepare land for wheat cultivation. In both villages larger farmers generally own more bullocks, as indicated by the high positive correlation coefficients.

Bhimad. Fewer than half of the farmers in Bhimad own bullocks. The number of working bullocks used per household fluctuates greatly from month to month as does the number of working hours for bullocks in each household. This is mainly because most farmers do not have their own working bullocks and rent bullocks for agricultural operations. The relationship between farm size and number of bullocks is not strong.

Gandruk. Most farmers own bullocks. Average working hours per household and per bullock are highest during summer planting months, as less land is cultivated for winter crops than for summer crops. There is a positive correlation between farm size and bullock holdings.

Kobang. Over half the farmers own bullocks (Male Lulu). Bullocks are busy from Baisakh through Asad for summer crop planting and during Aswin and Kartik for winter planting. During other months, they are idle. The low correlation coefficient for farm size and number of bullocks shows there is little relationship between these variables.

Table 14. Animal Power

Months	Waling			Chilaunibas			Bhimad			Gandruck			Kobang		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Baisakh	34	4.2	3.5	22	2.3	3.3	51	3.1	4.3	25	2.6	4.3	20	0.8	1.0
Jestha	34	3.4	3.1	22	2.4	3.4	12	0.6	5.7	26	3.0	5.7	21	2.2	2.8
Asad	34	4.3	3.6	22	3.3	4.4	34	2.3	6.3	26	3.5	6.3	29	3.0	2.8
Srawan	33	3.3	3.2	22	1.5	2.4	5	0.5	1.7	24	1.3	1.7	-	-	-
Bhadra	33	-	-	17	-	-	7	1.3	1.0	25	0.4	1.0	-	-	-
Aswin	33	-	-	16	-	-	6	0.4	4.2	25	4.0	4.2	18	0.8	1.2
Kartik	33	0.3	0.3	19	0.1	0.2	59	1.4	1.4	20	0.8	1.4	36	4.7	2.7
Mangsir	33	0.1	2.5	21	0.6	1.2	11	1.3	0.3	24	0.4	0.3	-	-	-
Poush	31	3.1	3.0	18	0.5	1.3	25	1.5	0.1	24	0.1	0.1	-	-	-
Magh	33	2.1	1.6	22	0.4	1.0	18	1.3	2.5	24	1.5	2.5	-	-	-
Falgun	33	2.5	2.4	20	1.1	1.4	29	2.5	2.6	22	1.8	2.6	-	-	-
Chaitra	33	3.2	3.0	20	1.2	2.1	36	3.3	1.4	22	1.0	1.4	-	11.4	10.5

1 = Number of working (ploughing) bullocks; 2 = Average working hours/household/day; 3 = Average working hours/bullock/day.

Table 15. Farm Size and Bullock Holdings

Farm Size	Waling			Chilaunibas			Bhimad			Gandruck			Kobang		
	Average Bullock Holdings														
Small farm	0.44			0.29			0.25			0			0.10		
Medium farm	2.25			0.71			1.40			1.00			2.00		
Medium large	2.42			1.43			1.86			0.50			2.20		
Large farm	3.50			2.50			1.50			1.75			2.17		
Correlation Coefficient	0.67			0.63			0.24			0.47			0.10		

Table 16. Livestock Holdings and Crop Area

	Waling				Chilaunibas				Bhimad				Gandruck				Kobang			
	SF	MF	LF	VF	SF	MF	LF	VF	SF	MF	LF	VF	SF	MF	LF	VF	SF	MF	LF	VF
Large Ruminants	3.4	9.0	7.4	13.5	1.1	3.3	6.1	10.0	1.8	5.0	7.4	12.0	1.0	4.8	4.3	8.4	0.4	7.0	12.6	20.5
Small Ruminants	-	-	0.3	1.5	1.1	1.8	3.0	2.0	1.1	4.4	2.4	9.0	-	17.0	7.1	16.3	-	-	0.2	-
Poultry	-	-	-	-	1.7	1.6	-	-	7.5	11.4	17.0	20.5	0.8	7.0	9.8	7.8	1.2	3.8	5.2	5.2
Paddy	2.0	6.1	13.0	25.0	2.2	3.5	9.1	21.5	-	3.0	10.6	51.0	0.3	1.8	4.0	18.0	1.1	3.9	7.3	21.7
Maize	1.9	7.1	7.9	23.0	1.7	4.7	7.6	13.5	3.3	9.8	12.1	20.5	0.3	5.8	10.0	14.7	0.7	1.5	2.6	4.0
Millet	0.4	2.6	3.3	8.5	1.6	3.8	7.6	7.5	3.3	9.4	11.9	20.5	1.3	2.4	8.0	10.6	-	-	-	-
Wheat	1.3	1.9	2.6	-	0.6	1.8	3.3	3.5	-	1.9	0.9	1.0	-	0.6	1.3	2.6	-	-	-	-
Sugar	1.3	1.9	1.4	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	1.4	3.0	3.7
Barley	-	-	-	-	-	-	-	-	-	-	-	-	0.2	1.2	4.8	2.9	1.7	5.2	9.8	17.8
Potato	-	-	-	-	-	-	-	-	-	-	-	-	-	0.4	2.3	5.5	0.2	1.3	2.8	2.9
Lowland	1.8	6.1	14.1	36.0	2.2	4.2	9.3	21.5	0.6	2.8	8.1	28.0	0.2	1.8	4.0	16.7	-	-	-	-
Upland	3.1	4.9	5.8	13.5	1.6	4.4	8.4	18.5	4.1	7.2	13.1	25.5	1.4	9.4	20.0	31.4	2.4	9.5	23.2	34.8
Farm size	2.5	5.5	9.9	24.7	1.9	4.3	8.8	20.0	2.3	4.5	10.6	26.7	0.8	5.6	12.0	24.0	2.4	9.5	23.2	34.8

SF = small farm; MF = medium farm; LF = large farm; VF = very large farm; Farm size = farm size in ropanis.

CROP PRODUCTION (Tables 17 and 18)

Paddy. More Waling farmers grow paddy than in other areas because there is more lowland (khet). Between 23 and 40 percent of the farmers use farmyard manure (FYM) while not more than 19 percent use chemical fertilizer. Highest yields are obtained in Waling, lowest in Gandruk.

Maize. Maize is grown on upland (pakho). Waling and Chilaunibas have the most farmers growing maize. FYM is used by most maize growers, but only in Waling is chemical fertilizer used. Bhimad has the most maize area and Kobang the least. Waling has the highest maize yields.

Millet. Kobang is the only village with no millet. Millet is inter-cropped with maize. The largest percentage of farmers grow millet in Bhimad but maximum acreage is in Gandruk and maximum yield is in Waling.

Sugarcane. Sugarcane is grown only in Waling. A few farmers use chemical fertilizers, but the majority use FYM.

Tori (Mustard). Waling and Chilaunibas are the only two study villages where mustard is grown. FYM is the main source of fertilizer, but 30 percent of the farmers also use chemical fertilizer.

Potato. Potatoes are found in Waling, Gandruk and Kobang. Kobang has the most growers and maximum yields. FYM is the main fertilizer.

Wheat. Waling has the most land devoted to wheat, but Chilaunibas has the largest percentage of growers and smallest wheat acreage. From 29 to 40 percent of the farmers use some chemical fertilizer for wheat.

Barley. Barley is grown in Kobang and Chilaunibas. FYM is used for barley in Kobang but not in Chilaunibas. A few farmers use small amounts of chemical fertilizers for barley cultivation in both villages.

Phaper (Buckwheat) and Uwa. Both are cultivated only in Kobang. Most farmers grow phaper. FYM is the main source of fertilizer for both.

Table 17. Chemical Fertilizer and Compost Manure

Crops	Waling			Chilaunibas			Bhimad			Gandruk			Kobang		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Paddy	97	19	30	90	-	40	43	10	23	59	9	28	-	-	-
Maize	100	13	100	100	-	77	97	-	90	66	-	56	78	-	78
U Paddy*	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-
Millet	84	-	-	93	-	-	97	-	-	91	-	50	-	-	-
Sugarcane	68	10	61	-	-	-	-	-	-	-	-	-	-	-	-
Tori	26	-	26	40	5	30	-	-	-	-	-	-	-	-	-
Potato	23	-	23	-	-	-	-	-	-	44	-	31	74	-	75
Wheat	48	29	42	90	40	33	-	-	-	25	3	16	-	-	-
Barley	-	-	-	17	7	7	-	-	-	59	3	34	93	3	93
Phaper	-	-	-	-	-	-	-	-	-	-	-	-	81	-	81
Uwa	-	-	-	-	-	-	-	-	-	-	-	-	59	-	59

1 = Farmers growing the crop (percent); 2 = Farmers using chemical fertilizer (percent); 3 = Farmers using FYM (percent). *U = upland

Table 18. Crop Production and Yields

			Cultivated area per household (ropani)	FYM per ropani (doko)	Chemical ferti- lizer per ropani (kg)	Output per household (muri)	Yield per ropani (muri)
<u>Waling</u>							
Khet	Summer	Paddy	7.1	0.1	2.1	2.4	3.3
	Winter	Wheat	2.5	15.9	5.0	3.3	1.3
		Maize	3.1	18.3	1.2	2.4	0.8
		Mustard	0.5	13.6	-	0.2	0.4
		Potato	0.3	17.6	-	0.9	2.6
		Sugarcane	0.5	NA	NA	8.3	17.9
Pakho	Summer	Maize	3.5	32.7	1.0	7.3	2.0
		Millet	3.0	-	-	3.6	1.2
<u>Chilaunibas</u>							
Khet	Summer	Paddy	4.9	25.3	-	12.9	2.6
	Winter	Wheat	1.8	13.3	5.3	2.0	1.1
		Barley	0.4	5.9	2.7	3.0	0.9
Pakho	Summer	Maize	5.5	25.5	-	5.6	1.0
		Millet	4.9	-	-	4.5	0.9
	Winter	Mustard	1.0	14.3	NA	0.7	0.7
		S. Potato	0.1	3.3	-	1.4	NA
<u>Bhimad</u>							
Khet	Summer	Paddy	6.7	4.5	2.9	10.6	1.6
	Winter	Wheat	0.6	10.8	1.6	0.7	1.2
Pakho	Summer	Maize	7.7	14.0	-	NA	NA
		Millet	NA	NA	-	NA	NA
	Winter	Mustard	0.1	3.0	5.0	NA	NA
<u>Gandruk</u>							
Khet	Summer	Paddy	0.5	1.3	-	7.9	1.1
		Maize	0.3	2.0	-	0.2	1.0
	Winter	Wheat	0.3	19.0	-	0.6	2.3
Pakho	Summer	Maize	5.6	13.2	-	4.5	0.8
		Millet	6.6	-	-	2.1	0.3
		Potato	1.0	1.0	9.2	2.1	2.2
	Winter	Wheat	1.0	0.2	-	1.3	1.0
<u>Kobang</u>							
Pakho	Summer	Maize	1.9	24.9	-	3.3	1.3
	Winter	Phaper	7.0	10.4	-	6.7	0.9
		Uwa	1.7	14.2	-	2.1	1.2
		Barley	7.6	13.2	-	7.6	1.4
		Potato	1.5	19.2	-	5.5	3.7
		Wheat	NA	NA	-	NA	NA

LIVESTOCK POPULATION PRESSURE ON CULTIVATED LAND (Table 19)

In Waling, Chilaunibas, and Bhimad, livestock and human populations per hectare of cultivated land are similar. In Kobang and Gandruk livestock outnumber people by as much as two to one. In Waling and Bhimad small farmers have the greatest livestock pressure on cultivated land. In Chilaunibas livestock per unit of cultivated land is similar for small, medium, and large farms but is much less for large farms. In Gandruk the maximum pressure is on medium farms. In Kobang small farms have fewer livestock per unit of cultivated land. This is because the medium large and large farmers have big herds of sheep in Gandruk and chouris in Kobang, which are raised on high altitude pastures.

CROPPING INTENSITY AND LIVESTOCK HOLDINGS (Table 20)

The relationship between livestock holdings and cropping intensity was examined. In general, the greater the cropping intensity the greater the total livestock holdings. Even in Gandruk and Kobang, where animals are raised on high altitude pastures, this relationship holds.

INCOME FROM LIVESTOCK (Table 21)

The main sources of farmers' incomes are crops, livestock, and employment. Estimated gross incomes were calculated from imputed and cash incomes. The average livestock contribution ranges from 12 to 21 percent. Income from crops in all villages increases with farm size. Livestock income varies with farm size; the bigger the farm, the more the livestock income. In Waling and Gandruk smaller farmers receive more income from livestock, and larger farms receive more from crops. In Chilaunibas and Bhimad, there is a tendency for small farmers to receive more of their incomes from livestock than the large farmers. In Kobang livestock contribute the largest share of total income.

Table 19. Livestock and Human Population Pressure on Cultivated Land

	Waling	Chilaunibas	Bhimad	Gandruk	Kobang
Livestock population per ha. cultivated land	10.3	9.8	11.7	12.8	15.8
small farm	13.6	11.6	16.7	12.5	3.3
medium farm	16.4	11.6	18.8	38.9	14.6
medium large farm	7.7	11.5	9.2	9.7	11.7
large farm	6.1	6.1	7.8	10.2	12.2
Human population per ha. cultivated land	10.4	11.0	9.8	4.9	5.3
Ratio of livestock and human populations	1.0	0.9	1.2	2.6	3.0

Table 20. Livestock Holdings and Cropping Intensity

	Mean livestock holding	Cropping intensity
Waling	7.9	146
Chilaunibas	6.1	140
Bhimad	6.8	120
Gandruk	14.8	188
Kobang	8.0	185

Table 20. Income Sources by Farm Size (Rupees)

	Small	Medium	Large	Very large	Average
Waling					
Crop	2699 (57)	6302 (67)	7011 (78)	21540 (86)	9388 (78)
Livestock	1982 (42)	2868 (31)	2003 (22)	3444 (14)	2574 (21)
Employment	33 (1)	167 (2)	-	-	50 (1)
Total	4715	9336	9014	24984	12012
Chilaunibas					
Crop	1693 (40)	2679 (60)	5006 (74)	8620 (67)	4499 (64)
Livestock	810 (19)	1045 (23)	855 (13)	2517 (19)	1307 (18)
Employment	1765 (41)	750 (17)	880 (13)	1800 (21)	1299 (18)
Total	4268	4474	6741	12937	7105
Bhimad					
Crop	962 (42)	3169 (78)	4540 (83)	11760 (89)	5108 (82)
Livestock	383 (17)	523 (13)	750 (14)	1410 (11)	766 (12)
Employment	929 (41)	368 (9)	200 (3)	-	374 (6)
Total	2275	4060	5490	13170	6246
Gandruk					
Crop	239 (20)	1988 (51)	4080 (69)	6125 (68)	3108 (60)
Livestock	167 (14)	814 (21)	831 (14)	991 (9)	705 (14)
Employment	783 (66)	1132 (29)	1040 (18)	2413 (23)	1367 (26)
Total	1189	3934	3951	10834	4977
Kobang					
Crop	2410 (69)	7414 (94)	10280 (81)	12913 (66)	77112 (76)
Livestock	365 (11)	464 (6)	2443 (19)	5842 (30)	2279 (21)
Employment	700 (20)	-	-	740 (4)	360 (3)
Total	3472	7878	1273	19495	10892

Percentage contributions are given in parentheses.

COSTS AND RETURNS OF LIVESTOCK KEEPING (Tables 22 and 23)

In this study, only costs and benefits for she-buffalo are computed. Local cows are not regularly milked, and adequate information on expenditures and returns of sheep and goats was not collected.

With an unrestricted grazing system and free access to green grass for cutting, these inputs have no market value. To compute costs, labor used for collecting green grass and fodder, for home management, and for grazing was priced at the prevailing market wage. Concentrate feed and dry fodder or straw were valued at market prices. Interest on initial capital invested was included. Milk and dung produced were valued at prevailing market prices as were any calves produced.

Table 22 shows that the highest net benefit from livestock was received by Waling farmers. The benefit-cost ratio of 1.5 is primarily the result of high milk prices. This ratio is also high in Bhimad as a result of low feed costs. Benefits equal costs in Chilaunibas. In Kobang the ratio for yak/naks is less than one. These losses are mainly the result of a high mortality rate. The estimated net returns per year for a Lulu cow and a pair of bullocks are Rs. 125 and Rs. 370 respectively. A poultry layer provides a profit of Rs. 160 per annum.

 Table 22. Costs and Returns of Local She-Bufferalo

	Operating expenses	Gross value of products	Net return	Benefit-cost ratio
Waling	2150	3190	1040	1.5:1
Chilaunibas	2149	2165	16	1.0:1
Bhimad	1620	1873	253	1.2:1
Gandrak	1966	2225	259	1.1:1

Table 23. Costs and Returns of Livestock Enterprises in Kobang

	Yak/Nak Herd	Lulu Cow	Bullock Pair	One Hen
Operating expense	8820	400	810	-
Gross value of products	6600	525	1180	160
Net return	-2220	125	370	160

MARKETS AND MARKETING SERVICES

The study ward in Waling is the only village close to a main bazaar, which facilitates the sale of livestock and livestock products on a regular basis. In the other study villages there is no local market for milk, eggs, and other livestock products. Only ghee--which can be preserved for a long time--and live animals are marketed. There are two channels for marketing ghee and live animals for these villages; farmers either go to distant markets during the off season or sell them to itinerant middlemen who take the ghee and animals to central markets.

CREDIT

Credit for livestock purchases is a problem because such purchases require relatively large capital outlays. One farmer in Waling, two in Chilaunibas, and two in Bhimad have received credit to buy buffalo and bullocks from cooperatives. Farmers more often received credit from local merchants for purchasing animals. Farmers in Waling and Bhimad have received loans from local merchants or landlords to buy buffalo and bullocks. Some farmers have purchased animals on credit. No information was available about credit for buying livestock in Gandruk and Kobang.

LIVESTOCK HEALTH AND DISEASE PROBLEMS

Animal health is a major problem not because farmers are not interested but because they face difficulties. Most farmers do not vaccinate animals as a result of the lack of vaccine and ignorance of the need to vaccinate against infectious diseases. Foot-and-mouth disease is common among bovines, and haemorrhagic septicaemia is serious in buffalo. Internal parasites are also common in buffalo and cattle. Pigs, sheep, and goats are not vaccinated against common infectious diseases nor are they treated for parasites. Both foot-and-mouth disease and haemorrhagic septicaemia are reported in sheep and goats. No specific diseases are reported for chickens but great losses are found from the incidental occurrence of various diseases. Wild animals such as jackals and wildcats also cause a great loss of chickens. In Kobang, no serious diseases are reported, but parasites are believed to affect most animals. Kobang has a harsh climate and when there is heavy snow many weak yak/naks, sheep, and goats die of starvation and cold.

VETERINARY SERVICES AND EXTENSION

In spite of prevalent chronic animal disease problems, veterinary services are not available in the study villages. Veterinary clinics are located in district headquarters, and transportation problems make it impossible for many farmers to take sick animals to clinics. The number of trained veterinarians and technicians is limited, and another serious problem is the limited supply of veterinary medicines. The majority of farmers use traditional methods to treat their animals. Some farmers use locally available herbs and medicinal plants and some farmers believe in supernatural causes of illness such as the evil eye and go to the village shamans ('dhami' or 'ghankri') to treat their animals. Livestock extension services are limited. Farmers are not taught about livestock health and diseases nor are they taught about livestock management.

SUMMARY

Village livestock production systems are backyard small-scale enterprises integrated with crops production; livestock and crops are complementary.

The caste system plays an important role in determining the types of livestock raised. Both Brahmins and Chhetries raise cattle and buffalo, but they do not raise pigs because they consider them unclean. Brahmins do not raise chickens. Occupational caste people raise pigs, goats, and poultry. The large number of sheep raised by Gurungs in Gandruk and the large number of yak/naks raised by Thakalis in Kobang are related to suitable environments for those animals. In addition to economic value, livestock are kept for religious and social purposes.

All livestock in the study areas are local breeds. The sources of stock are local markets and domestic production. Farm size, family size, and education are all related to livestock holdings. Cattle and dry buffalo are freely grazed on open communal pastures and forests. Lactating buffalo are mostly stall-fed but are sometimes grazed on nearby wastelands. During the rainy season, green grass is the main feed source while during the winter the main source is straw. There is little production of straw as a crop by-product which leads to a winter problem of feed and fodder. Lactating buffalo and working bullocks are fed 'kudo,' a homemade concentrate. No purchased concentrate is fed.

Sheep in Gandruk, and yak/naks in Kobang are raised transhumant on high altitude pastures where there are no settled human populations.

In three of the villages studied, villagers grow various species of fodder trees. However, the amount of tree fodder collected is limited because the farmers have only a few trees planted on their land. No farmer in the study area is growing any improved species of grass.

An average household spends at least a man-day (eight hours) to maintain livestock by collecting green and fodder grass, and feeding. This excludes grazing which varies from seven to fourteen hours a day.

Milk production is a function of the amount of green grass fed to lactating animals. Daily production is highest during Asad-Bhadra with the abundant availability of green grass.

None of the farm households in the study area raise poultry on a commercial basis. The poultry raised are all local breeds with low weight gaining rates, low egg production, and low hatching rates

Sheep are the predominant animals in Gandruk. They are raised in large herds which require substantial investment and it is the large farmers who own them. Similarly, the large farmers in Kobang own the predominant animal--the yak/naks.

Bullocks are the main source of draft power. Farm size and number of bullocks are positively correlated in all villages except Kobang.

Waling has the most paddy cultivation and the highest paddy yield. All farmers in both Waling and Chilaunibas grow summer maize on upland. The highest maize and millet yields are harvested in Waling. Bhimad and Gandruk have the lowest yields of most crops harvested. The main source of fertilization for crops is farmyard manure. Only a few farmers use chemical fertilizer, and they use only small amounts.

Livestock outnumber people in Kobang and Gandruk while the ratio in other villages is about one to one. Livestock puts more pressure on cultivated land of small farmers in Waling and Bhimad. High cropping intensities are generally associated with larger livestock holdings.

The contribution of livestock to the total income of farmers is important. It ranges from 12 to 21 percent for all the study villages. In most of the villages, livestock is second to crops in total income.

The benefit-cost ratio of raising female buffalo in the study areas is above one, indicating that this is financially profitable. It is difficult to determine whether raising cows is financially profitable from the incomplete information available.

Preliminary data from Kobang show that keeping a pair of bullocks provides some net return as does keeping poultry. Raising yak/naks has not been profitable, primarily as a result of the high mortality rate and high imputed investment. Marketing appears to be a problem for livestock development in the study areas. Only in Waling is there a market for liquid milk; because of this farmers in Waling raise more female buffalo than those of the other villages where there is no immediate market for milk. In other villages the percentage of milk production used for ghee and butter is higher than in Waling.

Credit is a major constraint to purchasing animals. Credit supplied by public financing agencies is negligible. Some credit from moneylenders and village merchants is used for purchasing animals, but interest rates are extremely high.

Extension agents are not available to help with animal health and disease problems. Animals are not vaccinated against infectious diseases because vaccinations are not available and farmers are ignorant of the need to vaccinate. There are no veterinary clinics in the study villages; sick animals are usually treated locally with traditional methods. Foot-and-mouth disease is common for bovines, and also affects sheep and goats. Internal parasites are often reported in bovines, sheep and goats. Haemorrhagic septicaemia is serious in buffalo.

POLICY RECOMMENDATIONS

The three major livestock problems are: (1) feed and fodder; (2) local breeds with low productivity, poor health, and high mortality; and (3) over-population. The following measures are suggested:

(1) Under the existing unrestricted grazing system individual farmers incur no costs for grazing animals and for collecting fodder and green grass, but villages as a whole suffer environmental losses. There is little management to improve pastures, and there are no incentives to reduce livestock holdings. It is thus extremely important to regulate grazing and grass-cutting in communal pastures and forests. Villagers could graze their animals on a rotational basis if they had property rights. Such regulation would permit better management of pasture land and forest and help reduce the livestock population because the cost of raising livestock would increase in proportion to the numbers raised.

(2) The chronic problem of feed and fodder indicates the need for drastic improvements in these resources. Villagers could benefit from a program to plant and nurture fast-growing fodder trees and improved grasses in wastelands, pastures, and forests. The government could support research to identify fast-growing fodder trees and improved grasses for specific agro-climatic zones and multiply and distribute seeds and seedlings. Incentives such as short trainings, in-country tours, and prizes for taking care of planted trees would be useful. Trees and grasses would not only supply livestock fodder but would also supply needed fuelwood, as well as conserve soil and prevent erosion.

(3) Lack of cash makes it difficult for farmers to replace existing local breeds, inherited from generation to generation, with improved ones. Most farmers have little cash income and savings are negligible. A program which included credit for cross-breeding would be useful.

(4) Farmyard manure is the main source of crop nutrients. Current use of chemical fertilizer is negligible and in the hills it is expensive and difficult to obtain. Lack of adequate use of fertilizers has been a constraint to increased crop yields. The costs and benefits of supplying fertilizers to hill farmers should be carefully evaluated.

(5) Animal health problems are serious throughout Nepal. To help mitigate these problems, government institutions could provide practical training in animal health and diseases to a few interested farmers who could set up veterinary clinics to treat minor animal problems in their villages. Vaccinations could be provided through these clinics. These veterinary practitioners should receive periodic refresher courses.

(6) Crops and livestock on small farms are interdependent; crop by-products are fed to livestock and livestock supply manure nutrients to crops and provide power for cultivation, threshing, and transportation. However, commercial livestock production concentrates wealth in the hands of a few rich farmers and deprives small farmers of the benefits of raising livestock. This suggests that raising bigger herds should be discouraged. In Gandruk and Kobang, a few farmers raise large herds of sheep and yak/naks and receive the main benefits of the high altitude communal pastures. There is a need to develop a system by which small farmers can keep sheep and yak/naks and benefit from communal pastures.

Appendix 1. Scientific Names of Fodder Trees

Local Name	Scientific Name
Tote	<u>Ficus hispida</u> L.
Gidagi	<u>Ginderi premna</u>
Berula	<u>Ficus clavata</u> Wall. ex Miq.
Kutmiro	<u>Litsea polyantha</u>
Badahar	<u>Artocarpus lakoocha</u>
Dabdabe (Ramsing)	<u>Garuga pinnata</u> Roxb.
Khanayo	<u>Ficus cunia</u>
Pakhuri	<u>Ficus glaberrima</u> Bl.
Kabro	<u>Ficus lacor</u>
Koiralo	<u>Bauhinia variegata</u> L.
Aankhapakuwa	<u>Ficus clavata</u> Wall. ex Miq.
Dhungre	<u>Ficus sp.</u>
Barro	<u>Terminalia belerica</u> C.B. Clarke

Appendix 2. Nepali and English Months

Baisakh (B)	=	April/May
Jestha (J)	=	May/June
Asad (As)	=	June/July
Jhrawan (S)	=	July/August
Bhadra (Bh)	=	August/September
Asoj (A)	=	September/October
Kartik (K)	=	October/November
Marga (M)	=	November/December
Paush (P)	=	December/January
Magh (M)	=	January/February
Falgun (F)	=	February/March
Chaitra (C)	=	March/April

Appendix 3. Measures

One ropani	=	0.05 ha. = 500 sq.m.
One mana	=	598 millilitre = 33.264 cubic inch
One muri	=	90.191 litres
One muri	=	20 pathi
One pathi	=	8 manas
One dharni	=	2.27 kg
One mana milk	=	0.57 litre
One bhari green grass	=	20-25 kg
One bhari tree fodder (excluding twigs and branches)	=	10-15 kg
One doko FYM	=	15-20 kg

Appendix 4. Cost and Return of Local She-Buffero, Waling

1.	Capital investment:		
	a) Buffalo	2000	
	b) Milking and ghee preparing utensils	600	
	c) Improvement of shed	50	
	Sub total		2650
2.	Operating Cost		
	a) Imputed feed and management cost for 300 days lactation		
	i) Green grass and fodder 405 bharis @ Rs.2	810	
	ii) Paddy straw and dry fodder 6 bharis @ Rs.10	60	
	iii) Concentrate mix 498 manas @ Rs.1	498	
	iv) Home management labor 120 hours @ Rs.1	120	
	v) Grazing labor 120 hours @ Rs.1	123	
	Sub total		1611
	b) Salt 225 muthies @ Rs. 0.25		56
	c) Feed cost for 65 dry days		
	i) Green 16.25 bharis @ Rs.2	33	
	ii) Dry straw 8 bharis @ Rs.10	80	
	iii) Concentrate mix	-	
	iv) Home management labor 26 hours @ Rs.1	26	
	v) Grazing labor 26 hours @ Rs.1	26	
	Sub total		164
	Interest on invested capital of Rs.2650 @ 12%		318
3.	Total cost		Rs. 2150
4.	Returns		
	a) Sale of 1245 manas of milk @ Rs.2	2590	
	b) Sale of a buffalo calf @ Rs. 400	400	
	c) Value of manure 12 cartload @ Rs.25	300	
	Gross value of products		Rs. 3190
	Net return = 3190 - 2150 =		Rs. 1040
	Benefit-cost ratio = 1.5:1		

Appendix 5. Cost and Return of Local She-Buffero, Chilaunibas

1.	Capital investment:		
	a) Buffalo	1800	
	b) Milking and ghee preparing utensils	600	
	c) Improvement of shed	50	
	Sub total		2450
2.	Operating Cost		
	a) Imputed feed and management cost for 300 days lactation		
	i) Green grass and fodder 285 bharis @ Rs.2	570	
	ii) Paddy straw and dry fodder 8 bharis @ Rs.10	80	
	iii) Concentrate mix 375 manas @ Rs.2	750	
	iv) Home management labor 120 hours @ Rs.1	120	
	v) Grazing labor 100 hours @ Rs.1	100	
	Sub total		1620
	b) Salt 300 muthies @ Rs. 0.30		90
	c) Feed cost for 65 dry days		
	i) Green 16.25 bharis @ Rs.2	33	
	ii) Dry straw 8 bharis @ Rs.10	80	
	iii) Concentrate mix	-	
	iv) Home management labor 26 hours @ Rs.1	26	
	v) Grazing labor 26 hours @ Rs.1	26	
	Sub total		145
	Interest on invested capital of Rs.2450 @ 12%		294
3.	Total cost		Rs. 2149
4.	Returns		
	a) Sale of 1050 manas of milk @ Rs.1.5	1575	
	b) Sale of a buffalo calf @ Rs. 350	350	
	c) Value of manure 12 cartload @ Rs.20	240	
	Gross value of products		Rs. 2165
	Net return = 2165 - 2149 =		Rs. 16
	Benefit-cost ratio = 1.0:1		

Appendix 6. Costs and Returns of Local She-Bufferalo, Bhimad

1.	Capital investment:		
	a) Buffalo	1800	
	b) Milking and ghee preparing utensils	600	
	c) Improvement of shed	50	
	Sub total		2450
2.	Operating Cost		
	a) Imputed feed and management cost for 300 days lactation		
	i) Green grass and fodder 300 bharis @ Rs.2	600	
	ii) Paddy straw and dry fodder	-	
	iii) Concentrate mix 300 manas @ Rs.1.25	375	
	iv) Home management labor 45 hours @ Rs.1	45	
	v) Grazing labor 42 hours @ Rs.1	42	
	Sub total		1062
	b) Salt 165 muthies @ Rs. 0.30		50
	c) Feed cost for 65 dry days		
	i) Green 16.25 bharis @ Rs.2	33	
	ii) Dry straw 16.25 bharis @ Rs.10	162	
	iii) Concentrate mix	-	
	iv) Home management labor 10 hours @ Rs.1	10	
	v) Grazing labor 9 hours @ Rs.1	9	
	Sub total		214
	Interest on invested capital of Rs.2450 @ 12%		294
3.	Total cost		Rs. 1620
4.	Returns		
	a) Sale of 355 manas of milk @ Rs.1.5	1283	
	b) Sale of a buffalo calf @ Rs. 350	350	
	c) Value of manure 12 cartload @ Rs.20	240	
	Gross value of products		Rs. 1873
	Net return = 1873 - 1620 =		Rs. 253
	Benefit-cost ratio = 1.2:1		

Appendix 7. Costs and Returns of Local She-Bufferalo, Gandruk

1.	Capital investment:		
	a) Buffalo	1800	
	b) Milking and ghee preparing utensils	600	
	c) Improvement of shed	80	
	Sub total		2480
2.	Operating Cost		
	a) Imputed feed and management cost for 300 days lactation		
	i) Green grass and fodder 417 bharis @ Rs.2	834	
	ii) Paddy straw and dry fodder	-	
	iii) Concentrate mix 162 manas @ Rs.1.50	234	
	iv) Home management labor 75 hours @ Rs.1	75	
	v) Grazing labor 240 hours @ Rs.1	240	
	Sub total		1392
	b) Salt 135 muthies @ Rs. 0.30		41
	c) Medicine		5
	d) Feed cost for 65 dry days		
	i) Green 16.25 bharis @ Rs.2	33	
	ii) Dry straw 13 bharis @ Rs.10	130	
	iii) Concentrate mix	-	
	iv) Home management labor 16 hours @ Rs.1	16	
	v) Grazing labor 52 hours @ Rs.1	52	
	Sub total		213
	Interest on invested capital of Rs.2450 @ 12%		298
3.	Total cost		Rs. 1966
4.	Returns		
	a) Sale of 1050 manas of milk @ Rs.1.5	1575	
	b) Sale of one buffalo calf @ Rs.350	350	
	c) Sale of dung 12 cartload @ Rs.25	300	
	Gross value of products		Rs. 2225
	Net return = 2225 - 1966 =		Rs. 259
	Benefit-cost ratio = 1.1:1		

Appendix 8. Costs and Returns of a Yak/Nak Herd, Kobang

Adult	Yak	1	@	Rs. 1500	=	Rs. 1500
Adult	Nak	16	@	2000	=	32000
3-4 years old	Yaks	2	@	1000	=	2000
3-4 years old	Naks	2	@	1250	=	2500
2-3 years old	Yaks	2	:	500	=	1000
2-3 years old	Naks	2	@	750	=	1500
1-2 years old Calves	Calves	5	@	300	=	1500
				Total		Rs. 42000
Sheds, equipment, utensils						4000
				Total capital cost		Rs. 46000

Annual Expenditures						
Salary of the herdman						700
Clothes, shoes, socks, and gloves						650
Food (barley, maize flour, phaper, rice)						1800
Salt for the herd						150
Local medicine (herbs, eggs, molasses, chhang, raksi)						100
Total						Rs. 3300

Annual Income						
At 72% calving rate, 11 calves are born; at 60% mortality rate, 6 calves die. Thus 5 calves would survive, so 5 naks would produce milk throughout the season.						
Butter from 5 naks @ 11 kg = 55 kg @ Rs.28						= 1540
Chhurpi from 5 naks @ 11 mana = 55 manas @ Rs.41						= 220
2 grown yaks for sale @ Rs.1000						= 2000
2 grown naks for replacement/sale @ Rs.1250						= 2500
Yak/nak wool @ 1 kg = 17 kg @ Rs.20						340
Total						Rs. 6600

Annual expenses						Rs. 3300
Interest on Rs.46000 capital investment @ 12%						5520
Total expenses						Rs. 8820
Net loss						Rs. 2220

N.B. Animal appreciation offsets depreciation on capital investment.

Appendix 9. Lulu Cow

Total income for 3 years		
400 litres milk @ Rs. 3.50		= Rs. 1400
manure		= 180
Total		= Rs. 1580
Total expenses for 3 years @ Rs. 400		
		= Rs. 1200
Net income		= Rs. 380
Net income per year = Rs. 125		

Appendix 10. Bullocks

A pair of bullocks costs		Rs. 1400
Annual expenses		500
Depreciation per year		140
Interest per year		170
Total		Rs. 810
Annual work taken for 50 days @ Rs. 20 = Rs. 1000		
Value of manure		1080
Total		Rs. 1180
Net return		Rs. 370

Appendix 11. Poultry

A laying hen costs Rs. 60. Feeding cost is negligible.		
It produces at least 60 eggs @ Rs.1.50		Rs. 90
and at least 2 pullets @ Rs.10		20
Total		Rs.160
