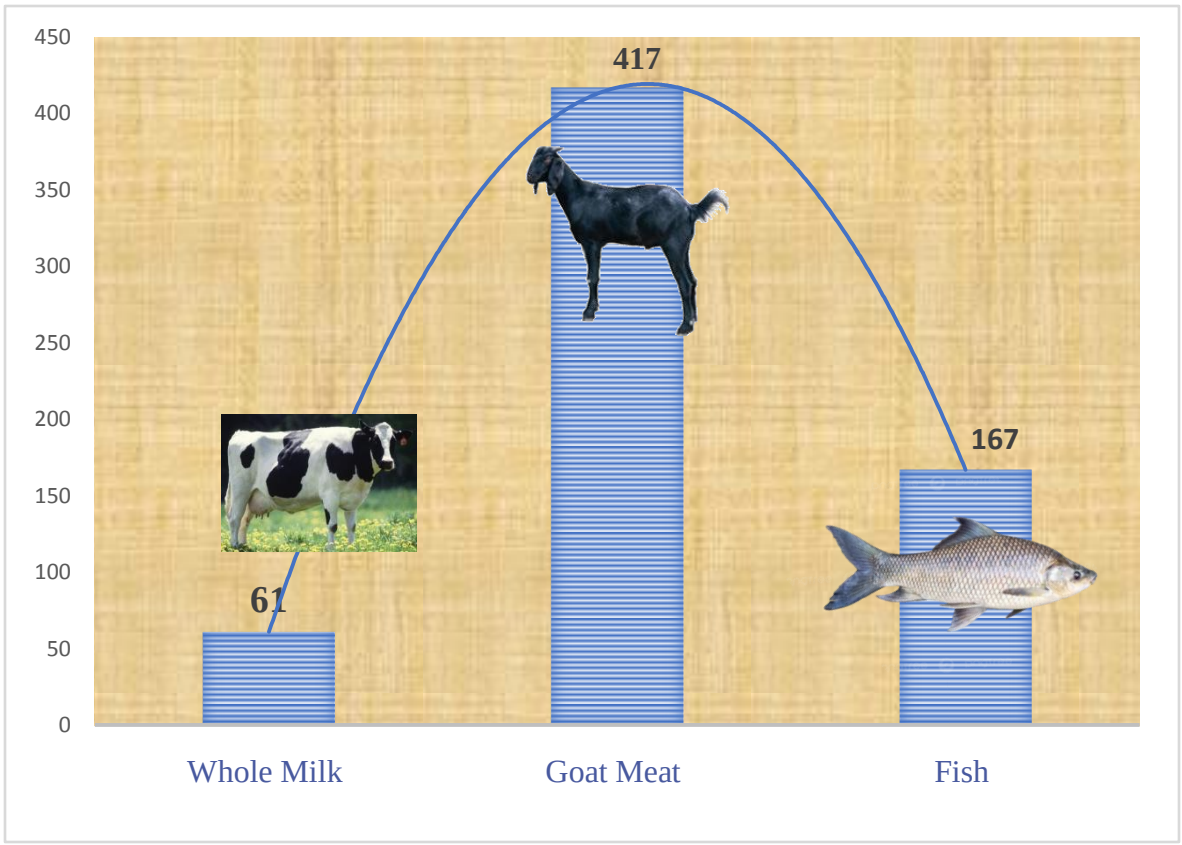
FINAL REPORT

ON

STUDY ON COST AND BENEFIT ANALYSIS OF MILK, MEAT, AND FISH PRODUCTS IN LUMBINI PROVINCE, NEPAL



Submitted to:
Directorate of Animal and Fishery Development
Ministry of Land Management, Agriculture and Livestock Management
Lumbini Province, Nepal

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ABBREVIATIONS AND ACRONYMS

BCR	Benefit Cost Ratio
CoDMP	Cost of Dairy Milk Production
CoFP	Cost of Fish Production
CoGMP	Cost of Goat Meat Production
CoP	Cost of Production
DDC	Dairy Development Corporation
DoLFD	Directorate of Livestock and Fishery Development
DoLS	Department of Livestock Service
FC	Fixed Cost
FCGMP	Fixed Cost of Goat Meat Production
FCoDMP	Fixed Cost of Dairy Milk Production
FCoFP	Fixed Cost of Fish Production
FCOP	Fish Cost of Production
FGD	Focus Group Discission
GM	Gross Margin
HS	Household Survey
KII	Key Informant Survey
LP	Lumbini Province
MoALD	Ministry of Agriculture and Livestock Development
MoALMC	Ministry of Agriculture, Land Management and Cooperatives
NLSIP	Nepal Livestock Sector Innovation Program
NM	Net Margin
PMAMP	Prime Minister Agricultural Modernization Project
PPCP	Public Private Community Partnership
PPP	Public Private Partnership
SNF	Solid Not Fat
TC	Total Cost
TS	Total Solid
UHTT	Ultra High Temperature Technology
VC	Variable Cost
VCFP	Variable Cost of Fish Production
VCODMP	Variable Cost of Dairy Milk Production
VCOGMP	Variable Cost of Goat Meat Production
VHLSKC	Veterinary Hospital and Livestock Service Knowledge Centre
WC	Working Capital

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EXECUTIVE SUMMARY

Livestock is the major backbone activity of the farmers in Lumbini province and is a part of life of the farmers since ancient time. However, no past studies have been initiated by the government agencies regarding the detail study on farmers' economics. This study was designed for two fundamental problems: i) what are cost and return of animal products in Lumbini Province? ii) Are any production and marketing constraints adhering cost of production of the dairy farmers, goat meat growers and fish-keeping farmers? With the financial support of Directories of Livestock and Fisheries Development (DOLFD), Lumbini Province, studying on production cost of milk, meat and fish in Lumbini Province is completed with the consulting service of SIRACS.

General objective of the study is to analyze the economics of production of milk, meat, and fish in Lumbini Province. The specific objectives are:

a. To study the cost and return of animal products of Lumbini Province.
b. To identify and rank problems associated with production and marketing of animal products.

The designed "study team" has been mobilized and followed standard protocol of surveying beneficiaries. The team accomplished household survey with randomly selected 225 farmers, 75 each for three sub-sectors. Data validation and triangulation has been completed by conducting focus group discussions (FGD) and key informant interviews (KII), observation of key business activities. Study team designed pre-tested structured questionnaires used KOBO Toolbox, and checklists for collecting data and descriptive information from FGD and KII. Further analysis of these data and problems completed by implying cost functions, gross margin analysis, benefit cost analysis and problem ranking tools. Summary of findings and key recommendations are explained for each sub-sector separately.

Summary on cost of dairy milk production and marketing in Lumbini Province

The population of dairy animals, milking animals, and total milk production in Lumbini Province is on an increasing trend. The province contributes 20% of the total national milk production, with an annual output of 515,696 metric tons. Buffaloes account for 66% of this production, while cows contribute 34%. The top five milk-producing districts in the province are Banke, Rupandehi, Kapilvastu, Dang, and Bardia. Terai districts, including Dang, generate 74.1% of the province's milk production, with the remaining 25.9% coming from six hill districts. The average milk productivity per animal is 854 litres per year, with buffaloes producing 860 litres and cows 845 litres.

The study analyzed the cost of dairy milk production using key economic indicators and social determinants, revealing variability in production costs. Among surveyed households, 39% were commercial farmers raising more than 10 animals for over 10 years. Farmers had constructed animal sheds on an average of 0.067 ha of land, with an additional 0.134 ha dedicated to cultivating forage grasses and fodder trees.

The average investment per farm, including fixed capital, working capital, and variable costs, was NPR 3,521,897. Total fixed capital investment across all farms amounted to NPR 123.9 million, which included major assets like sheds, vehicles, farm boundaries, cooling and chilling equipment, and more. On average, each farm invested NPR 1.67 million in fixed assets. The largest proportion of this investment was allocated to infrastructure, with animal sheds (58.72%), vehicles (14.45%), and farm boundaries (6.73%) comprising the bulk of the expenditure. This highlights that dairy farming in Lumbini Province is capital-intensive, requiring substantial long-term investments in infrastructure, transportation, and staff. Likewise, estimated working capital, the study estimated, was NPR 72.8 million (≈ NPR 909,000 per farm) that was invested for buying milking cows, buffaloes, and fodder trees cultivation. Working capital accounted for approximately 38% of total costs. The five-year average depreciation rate for fixed and working capital was estimated at 12% of

the initial investment. Finally, variable costs, including feed, daily labor wages, forage, and treatment, amounted to NPR 69.43 million (≈ NPR 938,235 per farm).

In terms of yield and income, the average annual milk production per farm was 31.6 metric tons, with total output across all farms reaching 2,338 Mt of raw milk. Based on a selling price of NPR 79 per litre, farmers earned an average of NPR 2.33 million per farm annually.

The estimated average cost of producing one liter of milk was NPR 60.93, with significant variations depending on farm size, geography, education, and herd size. Fixed costs contributed NPR 4.80/ litre, working capital costs were NPR 30.34/litre, and variable costs accounted for NPR 24.24/litre. The Benefit-Cost Ratio (BCR) of 1.89:1, along with healthy gross and net margins, reflects overall profitability, though these indicators were less favorable for small-scale dairy farms.

Farmers ranked "High cost of milking animals" as the top production constraint, while "delayed payments of sold milk" emerged as the leading marketing problem. The study also identified several other challenges contributing to the rising cost of milk production and reduced income from existing markets. Key suggestions were proposed to solve these problems aiming to enhance profitability and sustainability for dairy farmers in Lumbini Province.

Summary on goat meat production and marketing in Lumbini Province

Goat farming, "also called poor man's cow," is one of the most popular income-generating enterprises. Lumbini Province contributes 18% of total holdings, 17% of total goat numbers, and 14% of improved goat-keeping, across 440,806 holdings raising 2.37 million goats. Local goat breeds account for 96% of the total goat population. The highest shares of improved goat-keeping were reported in Nawalparasi West (8.1%) and Rupandehi (6.9%).

The average goat farmer in the study was 46.63 years old, had a primary-level education, and over 10 years of farming experience. Farms were categorized as subsistence or small-scale (fewer than 19 goats), semi-commercial (20–49 goats), and commercial (more than 50 goats). Most farmers raised crossbreeds (local with improved breeds) and kept them in semi-improved sheds with stall feeding.

For fixed capital investments, farmers spent NPR 38.4 million, which accounted for 68% of fixed and working capital, and 46% of the total cost. The average investment per farm was NPR 518,857, with a range from NPR 9,400 to NPR 11.5 million. Sheds represented the largest share, contributing 35% of fixed and working capital and 23% of the total cost. Farmers used an average of 0.04 ha of land for sheds.

In terms of working capital, investments in doe, intact, and fodder plantations totaled NPR 18,267,650, with an average investment of NPR 246,860 per farm. Farmers had 3,565 goats (including doe, intact, and kids), with an average of 48 goats per farm. The total number of doe was 2854, averaging 39 doe/farm. These three categories—doe, intact, and fodder plantations—made up 32% of the total fixed cost and 22% of the total cost of goat farming.

The total variable costs amounted to NPR 27,127,309, with an average of NPR 366,585 spent per farm. Variable costs accounted for 32.38% of the total cost of goat farming. Labor and feed were the largest contributors to variable costs, making up 51% and 36.13% respectively, with shares of 17% and 12% in the total cost of goat farming.

The average cost of goat meat production was NPR 417 per kilogram, ranging from NPR 369 for commercial farms to NPR 477 for small-scale operations. Variable costs accounted for NPR 260, fixed costs for NPR 80, and working capital for NPR 77 per kilogram. These costs varied based on farm size and location. The study found that farms with improved shed systems had better economic outcomes, and the benefit-cost ratio (BCR) of 2.17:1 indicated that farmers earned an additional NPR 1.17 in profit for every rupee invested. This BCR, along with positive gross and net margins, showed that goat farming was a financially viable enterprise across all farm sizes.

The main production constraint was "the poor scientific management system, resulting from inadequate technical and physical support". On the marketing side, the key constraint was a "lack of investment in meat marketing infrastructures". The study also noted a shift in market dynamics from the sale of castrated he-goats to intact he-goats, with cooperative-run collection centers had been gaining prominence in the supply chain.

Summary on cost of fish production and marketing in Lumbini Province

Fish farming has become a vital income source for 7,596 farmers in Lumbini Province, averaging 0.23 ha in coverage and 3.45 t/ha in productivity. The top fish-producing districts are Rupandehi, Kapilvastu, Banke, Bardia and Nawalparasi West.

Adult farmers, primarily without formal education, had managed small (≤0.33 ha), semi-commercial (≤1 ha), and commercial (>1 ha) farms. The average fixed capital investment was NPR 1.73 million per farm, with pond excavation accounting for 42% of the total production cost. Variable costs (feed and labor) formed 80% of expenses, with an average cost of NPR 167/kg.

Farmers earned NPR 89.59 million by producing 352 Mt of fish, with carp species generating the highest income (NPR 29.9 million). The average cost of production is NPR 167/kg, with commercial farms achieving lower costs. Benefit-Cost Ratios (BCR) vary from 0.94:1 to 4.29:1, with an average of 2.12:1, indicating higher profitability to commercial aquaculture compared to small-scale farming. Although average productivity of small-scale farms was 8.87 Mt/ha, their cost of production was nearly 15% (NPR 192) higher as compared to average farms, because of higher (16%) variable cost. Unlike it, CoP of commercial farm was 25%, 26% and 34% lesser that average farms, semi-commercial and sub-commercial farms, respectively.

Key production constraint was "disease management" while market competition, and pricing volatility was first problem ranked under marketing constraints.

Overall recommendation

Key recommendations focus on sustainably improving dairy milk, goat meat, and fish production and marketing. The Ministry of Agriculture and Land Management (provincial level) and the Ministry of Agriculture and Livestock Development (federal level) are urgently suggested to adopt a long-term investment strategy, targeting both backward and forward-linked markets. Input-based subsidies should address major production cost factors like capital investment in sheds/ponds, working capital, feed/forage, labor, and treatment. Output-based subsidies should be updated annually based on production costs. Both support (input based, out-output based or both) should be provided based on cost of production estimation in order to increase their competitiveness in marketing these produces. Future budget allocation should be guided across five key investment pillars:

- Housing and pond infrastructure management: 20-30%
- Resource centers and breed/fish seed management: 25-30%
- Feed and forage management: 20%
- Health, treatment, and sanitation: 10%
- Marketing management for dairy, goat meat, and fish: 10%

INTRODUCTION

1.1 Background

Directories of Livestock and Fisheries Development (DOLFD), Lumbini Province has demanded consultancy service for studying on production cost of milk, meat and fish in Lumbini Province. The context of the study is relevant because of is one of the seven provinces of Nepal that is located in western and mid-western part of the country. It comprises of 12 districts among which, 6 are situated in terai region while others are located in mid hills. Terai districts like Nawalparasi, Rupandehi, Dang, Banke, Bardiya has great potential in cattle/buffalo/poultry and fish farming while goat farming is suitable in hill districts. Despite having the favorable climatic and geographical condition for livestock farming, Province is one of the heavy importers of live animals and its products that worth millions of rupees every year. Livestock has a great potential and plays a pivotal role in increasing province as well as national economy of a developing country, like Nepal. Livestock farming is still in subsistence phase and farmers don't keep the records and estimate the financial appraisals of their farms. With the increasing demand in animal products, it becomes imperative to improve the production. Keeping this in mind, the economics of livestock farming must be accessed to explore financial ground reality and to strategize in cost minimization and profit maximization which will eventually ameliorate the living standard of farmers. Cost of production is the total expenses incurred by an enterprise in the process of production of goods or services. It gives an economic assessment of farming operations and helps farmers to in prospects their operational decisions and set the benchmark to increase production by optimizing the available limited resources as well as improve the market performance.

1.2 Objectives of the study

General objective of the study is to analyze the economics of production of milk, meat, and fish in Lumbini Province. The specific objectives are:

c. To study the cost and return of animal products of Lumbini Province.
d. To identify and rank problems associated with production and marketing of animal products.

Under first objective, study has focused the “Cost and Return Analysis” of cow and buffalo milk, goat meat and fish products. Under milk, study has discussed milk of commercial cow and buffalo farms: group-managed, firms and companies. Cost of production of meat products included semi to commercial farming of goat farms, especially intact, castrator and doe. For analyzing cost of production of fish, study aims to include carp farming in polyculture under integrated, semi-integrated or extensive farming system.

For identifying problems associated to production and marketing, study teamhas ranked value-chain actors for milk, goat meat and fishery-specific input suppliers, growers, collectors, traders and consumers. These problems are listed and ranked as most to less important. Among input suppliers: study consulted breed/fish seed suppliers such as (hatcheries and nursery) and machinery suppliers (water pump, tractor, nets) chemical suppliers (agrovet and pet-vet shops). For identifying marketing problems of meat products, study visited dairy (cooperatives, firm and companies), slaughter house owners, live and fresh fishery traders.

1.3 Rationale of study

Studying these objectives would fulfill part of objectives taken by the provinces for meeting inclusive, competitive and sustainable livestock and fisheries growth. This cost of production would be base-points for making decision for provincial government or sole Ministry of Land, Agriculture and Cooperatives for using policy-making, allocation of input-or-output subsidies. Documentation

and publication will bring supports to DOLFD's beneficiaries such as input suppliers, growers, marketers and consumers and collaborating government and donor agencies. Study has supported future planning, budgeting, executing, and regulating activities.

1.4. Expected outcomes

The consulting service has provided following expected resultsas aimed by the Directorate of Animal and Fishery Directorate, Lumbini Province.

- Analyzed cost and return analysis of raw milk and ranking of major production and marketing constraints of dairy enterprises;
- Analyzed cost and return of goat meat, and ranking of production and marketing constraints;
- Analyzed cost and revenue of fishery products, and ranking of major production and marketing constraints.

1.5 Limitations of the study

This study is completed in three different limitations: budget, time and information constraints. First, allocated limited budget to accomplish the targeted objectives and expected outcomes, this study was only possible with the selected experts to achieve the given Terms of Reference (ToR). Second, finalization of selection of consulting firm completed in the last trimester of the fiscal year 2081/81. Reaching respondents in a hottest day of the year faced a lot of challenges and some of the enumerators became sick due to hot waves and loo in Rupandehi, Nawalparasi and Kapilvastu district. Time was also unfeasible to collect samples from remote areas, or wait particular respondent till next day than that allocated time. Third, as cost and benefit analysis need accurate data of each farm, we did not find records of the farmers. All the information is based on the memory of information the farmers had.

Irrespective of these constraints, SIRACS has completed a given task on time with mobilizing right experts on right time. May be some areas missing, have chosen beginning of the low samples, uncover many diverse samples, because of time and resources. Coverage, damage and losses or additional income from insurance claims are not uncovered into benefit analysis. However, all issues are covered with the inputs of experts visited in the validation workshop.

2. STUDY METHODOLOGY

2.1 Study team recruitments and mobilization

SIRACS had selected and mobilised following five positions as study team for the proposed study.

Team Leader: A team leader was hired for six-week duration, who had completed Master of Science in (Agricultural economics). He had fishery, dairy and goat study experiences of more than ten-year experiences.

Dairy and fodder production expert: This expertise was hired for two-week's working days who had completed Master in Animal Science and had at least ten years working experiences in dairy, goat meat and fishery farming.

Fishery expert: A fishery expert was hired for two-week period who had completed Master in Fishery and Aquaculture Science and had at least ten-year experiences in different types of fishery-keeping systems.

Meat expert: A meat expert was hired for two-week period who had completed Master in Veterinary Science and had at least five years experiences in different types of meat animals farming.

Enumerators: SIRACS hired six enumerators, each for 15 days employment, who had completed intermediate level education (in agriculture), BSc (Ag) or Bachelor in Commerce. They had experience of surveying, motor cycle license and have idea of smart-phone use. They were trained into using KOBO online survey tool, undertaking interview, submitting dataset, photos and draft field report.

2.2 Study design and data need

As per ToR, study team followed survey research design in order to collect data from concerned beneficiaries and services providers. Major analysis of the study is based on primary data. This task also demanded secondary data in milk, meat, and fish, which were collected during field visits or e-resources. The secondary data included survey reports, progress reports of DoLFD, VHLSKCs and Statistics of MoALM, PMAMP and MoALD. Thus, this study used a mix method approach comprised of both quantitative and qualitative data collection methods and finalize the survey tools in consultation with DoLFD.

2.3 Sampling and sample size selection procedure

2.3.1 Selection of District and production centres

Lumbini Province has 12 districts. Out of these twelve districts study selects following five Terai districts such as Bardia, Banke, Kapilvastu, Rupandehi and Nawalparasi West and Hill districts such as Arghakhanchi and Palpa were selected propulsively as first stage of selection. Reasons behind the selection of these districts were:

- Districts were popular for the products of animals such as milk, meat, and fish
- These districts have Indian Border effect, fully and in a partial form
- District like Palpa and Arghakhanchi were selected as hill districts to compare cost of production of milk and goat meat. It was because, farmers were keeping different breeds, cultivating varied fodder and forage and farming system was mainly labour intensive.

Selection of production centres was also done purposefully and finalised with the officers of Directorates. We selected partially traditional farming, moderately semi-commercial farms and dominantly commercial farms so that our results could represent average of all-type farming not only for cattle, buffalo farm but also for goat-farming and fishery keeping. Study centres are selected under three-stage of selection process. In the first stage, seven districts are selected considering terai and hill districts. These are mentioned in figure 1.

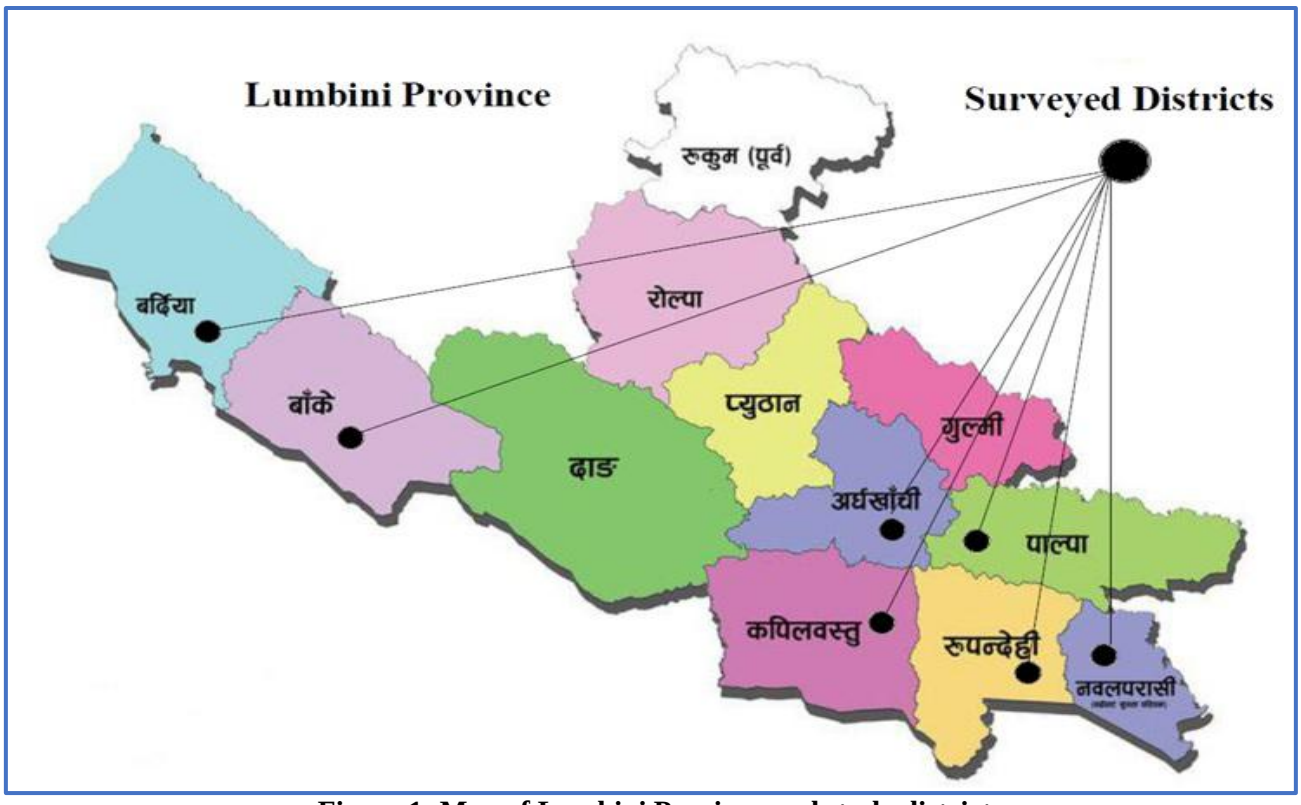


Figure 1: Map of Lumbini Province and study districts

In the second and third stage, wards and cluster in municipalities or rural municipalities were selected for those particular districts. (Table 1).

2.3.2 Sample size in the study area

Study selected roughly 2-5% of total inventory prepared for selected commodities based on registered farmers groups, cooperatives, firms and companies of above-mentioned districts and clusters (table 1 and 2). This sample size was agreed during inception presentation.

Table 1: Sample size selection for different animal products and clusters of districts

Districts	Study area	Dairy (cow, buffalo milk)	Meat (Meat)	Fish	Total sample
Arghakhanchi	Sitganga Malarani Sandhikharka	-	10	-	10
Rupandehi	Devdaha, Tilottama, Siddharthanagar Sainamaina Butwal Siyari	15	20	20	55
Nawalparasi	Sunuwal Pratappur	10	10	20	40
Palpa	Tansen, Tinau, Rampur, Purbakhola	20	10		30
Kapilvastu	Kapilvastu, Buddhabhumi, Banaganga	15	20	15	45
Banke	Kohalpur Khajura	15	15		30
Bardia	Badhaiyat Basgadhi	0	0	20	20
Total		**75**	**75**	**75**	**225**

Table 2: Samply size by organization

Name of organization	**Name of study sub-sector**			**Total sample**
	Dairy Milk	**Goat meat**	**Fishery**	
Farmers group	22 (9.8)	19 (8.4)	5(2.2)	46 (20.4)
Cooperative /committee	20(8.9)	6(2.7)	7(3.1)	33 (14.7)
Firm	28 (12.4)	39 (17.3)	49(21.8)	116 (51.6)
Company	5 (2.2)	10(4.4)	14(6.2)	29 (12.9)
Total	75 (33.3)	75 (33.3)	75 (33.3)	225 (100)

Note: Value in bracket shows percentage

We dropped one sample for goat meat study and 2 samples of fishery because of outlier issue. Goat sample was selling kidsfor future rearing purpose. For fishery, they had more priority of nursery and less inputs for productions activity.

2.4 Data collection technique

This study will conduct farm survey (HS), focus group discussion (FGD), key informant interview (KII), case study. These are described in detail under each subheading.

2.4.1 Household survey

The enumerator did interviews with 225 individuals of selected animal raising or fish-keeping owners. Among them, 20%, 15% 52% and 13% were farmers' group, cooperatives, firms and companies. In total, study did 33.3% survey for each animal product purpose. By production level, equally one third of each sample were selected for small-scale, semi-commercial and commercial farming. Household survey interviews conducted by using structured-structured questionnaire for dairy milk production, goat meat production and fish production are described in Appendix 1, Appendix 2 and Appendix 3, respectively.

2.4.2 Organized key informant interview

The study team (Appendix 12) conducted four 12 Key Informant Interviews (KII) with office chiefs, officers or technical staff of Ministry, Directorates of Livestock and Fishery Development (DoLFD) staff of Veterinary Hospital &Livestock Service Knowledge Centre (VHLSKC) and proprietors of companies and cooperatives by using semi-structured checklist, which is attached in Appendix 4.

2.4.3 Conducted focus group discussion

Study team also conducted 9 focus group discussions (FGD) including Rupandehi (for fish, meat and dairy), Palpa (for meat, milk), Nawalparasi (for fish, meat, dairy), Kapilvastu (meat, fish, dairy), Banke (for dairy, fish and meat). A semi-structured checklist, shown in Appendix 5, 6, 7, was used for collecting data and information from executive members of groups, cooperatives members, firms and company related to production and marketing strengths, weaknesses, opportunities and treats.

Both KII and FGD methods, triangulated household survey results in qualitative and quantitative form.

2.5 Primary data collection tools

2.5.1 Structured questionnaires

Team Leader designed structured questionnaires (Appendix 1 to 3), pre-tested these in adjoining areas and final set designed into KOBO toolbox (in English and Nepali) for household survey of dairy milk producers, goat-keeping farmers and fish-keeping farmers. Both close-ended and open-ended questions were set to meet the objectives of the study. Finalized questionnaires were executed from KOBO software, answer of each question from the farmer were entered automatically into the cloud and downloaded excel formats.

2.5.2 Checklists

Consulting team used a semi-structure format (Appendix 4-7) for collecting data from FGD, KII study. Some important KII or FGD were also recorded in the audio form.

2.5.3 Photographs

Some images of farm survey, KII and FGD were snapped by using smart phone and displayed during validation presentations and included in the final report (Appendix 9, Appendix 10, Appendix 16)

2.6 Data compilation and analysis

The Team Leader compiled data and information collected via clouds in KOBO Toolbox or checklists of FGD and KII. The collected information tabulated, coded and analyzed by using descriptive and empirical tools. The proposed inferential tools are: cost of production, gross margin, net margin net-profit, price spread, producer's share, trend analysis, Normal, or compound annual growth rate.

2.6.1 Cost of production

For analyzing the cost of production, both the fixed and variable cost components will be taken into account. Fixed costs comprised expenses related to shed construction and obtaining equipment but these cost's depreciation value was taken into account by using diminishing balance method to compute cost of fixed assets used for dairy animals, goat and fish. The variable costs included expenditures for day-day cost of feed, seed or breed use, medical supplies, vaccines, labour,

electricity and miscellaneous items. The equation shows sum of all the costs incurred while producing raw milk, goat meat and life fish

$$CoP\ (Rs) = C_{fixed} + C_{feed} + C_{seed} + C_{labor} + C_{parasite} + C_{other}$$

2.6.2 Benefit-cost ratio analysis

Banja *et al*. (2017) stated that a benefit-cost ratio is an indicator, used in the formal discipline of cost-benefit analysis that attempts to summarize the overall value for money of a project or proposal. Therefore, the Benefit-cost ratio was calculated using the following formula:

$$\text{B/C ratio} = \frac{\text{Discounted income (NRs.)} of\ last\ five\ years}{\text{Discoutned variable cost of last five years + Fixed cost NRs.)}}$$

Gross margin analysis: A gross margin estimation takes place by deducting the total variable cost gross return as shown in formula below.

$$Gross\ margin\ (GM) = Gross\ return\ (GR) - Total\ variable\ cost\ (TVC)$$

where,

$$Gross\ return\ (GR) = production\ quantity\ X\ Price\ of\ vegetable$$

Net profit: Net profit refers to net earnings after deducting fixed cost from GM.

$$Net\ profit = Gross\ margin - Total\ fixed\ cost.$$

2.7 Problem analysis

Study used both descriptive and partly empirical techniques for production and marketing problem analysis considering cost of production (COP) of these products.

2.7.1 Production constraints ranking and analysis

Study also ranked key input-output interlinked problems said by the farmers.

2.7.2 Marketing constraints

The marketing constraints were analyzed by using empirical method and descriptive methods. Study had elaborated these problems with some of market inefficiency variables called price spread, producer's share and marketing channel and trade related issues.

Price spread from farm to retail was the difference between the farm gate price and the price paid by the consumer at retail market. $Price\ spread = P_R - P_F$

Where, P_R = Retail price and P_F = Farm gate price. Higher price difference between retail and farm get means market is inefficient.

2.7.3 Indexing

Para-quantitative scaling method was used to rank key problems of dairy keepers, goat keepers, and fish farmers under five- point scaling techniques comprising immediate problem to least serious ranking. The scale value was 5, 4, 3, 2 and 1 used to rank most serious, serious, moderate, fair and the least serious problem, respectively. The mathematical formula used was:

$$I_{imp} = \sum \frac{S_i f_i}{N}$$

Where, I_{imp} = Index of importance

Σ = Summation

S_i = Scale value at i^{th} importance

f_i = Frequency of importance given by the respondents

N = Total number of respondents

2.8 Organized meeting and sharing reports

SIRACS Nepal delivered and participated in two meetings: Inception meeting and final validation meeting /workshop.

2.8.1 Inception meeting

The inception workshop was held on 2080/01/30 at an office hall of Directorate of Livestock and Fishery Development, Butwal. The inception presentation took place among 25 personnel and team members of SIRACS presented study methodologies with questionnaires and checklists. The inception report was presented as per suggestions provided by the participants. The meeting minutes, and participants attendance and photos are attached in Appendix 8 and 9

2.8.2 Validation workshop

The consulting service organizeda validation workshop on 16th Asar, 2081 by including 26 experts of different fields. The DoLFD coordinated for inviting suitable experts. The Team Leader had presented findings of the study in front of attendees, as listed in Appendix 16 and 17. Feedbacks and suggestions had been included in this report.

2.9 Time schedule of study

SIRAC's study team proposed a schedule to complete the study. Role of each team members also included including reporting dates to the Directorate (Appendix 11 and 12). Summary of expert team use was six weeks for Team Leader and 2 weeks for other experts. Consulting team also requested additional time for report finalization.

3. FINDINGS AND DISCUSSION

This section has been divided into three parts: part 1 describes dairy milk production related costs and benefit analysis, part 2 explains goat meat specific benefit and cost analysis, and part 3 elaborates fishery-specific analyses for cost and benefit of production and marketing.

PART 1: COST OF PRODUCTION ANALYSIS FOR DAIRY MILK

3.1 Livestock population and milk production statistics in Lumbini Province

The dairy animal statistics and milk production are outlined in Table 3. The province has 2.4 million cows and buffaloes, with the buffalo population being notably higher (52.2%) than cows (47.8%). Among the districts, Banke has the higher population of both cows and buffaloes, followed by Kapilvastu and Dang. These dairy animals are raised for milk, meat, draft, manure, and income generation purposes. Of the total population, dairy animals make up about one-fourth (24.87%), with buffaloes constituting 32.12% and cow 16.95%. By districts, Rupandehi has the largest population of dairy animals (33%), while Rukum East has the lowest.

At the national level, 590,091 holdings raise livestock, with 192,702 households (32.65%) in Lumbini province keeping 517,209 cattle, averaging 2.68 cows per household. Among these, improved cattle, including crossbreeds, represents 5.56% (28,726 animals). Additionally, 288,079 holdings (48.8%) keep buffaloes, with a total of 658,984 (2.3 animals (2.3 buffaloes per farm), of which 5.7% are improved breeds, such as Murrah or cross breeds (NSO, 2024).

Table 3: Cattle and buffalo population and milk production in Lumbini Province

Name of districts	Total population			Milking animal population			Milk production (Mt)		
	Cow	Buffalo	Total	Cow	Buffalo	Total	Cow	Buffalo	Total
Argha'chi	37526	90178	127704	5741	25791	31532	4329	23719	28048
Banke	211244	194484	405728	34665	60679	95344	32754	53033	85787
Bardiya	116599	130955	247554	18516	45179	63695	18487	38311	56798
Dang	135242	145283	280525	22450	46781	69231	18089	39250	57339
Gulmi	42390	48277	90667	6910	14531	21441	4775	12290	17066
Kapilvastu	156096	148732	304828	24975	43876	68851	25436	39538	64974
Naw'si West	75036	64859	139895	14107	21970	36077	14880	20652	35532
Palpa	72454	92664	165118	11738	28818	40556	9527	26408	35935
Pyuthan	71531	75900	147431	11588	22087	33675	7112	17965	25077
Rolpa	94440	55940	150380	16735	15887	32622	10231	11360	21592
Rukum East	17037	17827	34864	2590	5244	7834	1588	4417	6006
Rupandehi	97446	164330	261776	21048	64089	85137	25820	55723	81543
Sub-total	1127041	1229429	2356470	191063	394932	585995	173029	342667	515696

Source: MoALD, 2023

Lumbini province contributes 20% to the national milk production. The annual milk production in the province is 515696 metric tons, with buffaloes accounting for 66% and cows contributing the remaining 34%. According to MoALD (2023), top five milk-producing districts are Banke, Rupandehi, Kapilvastu, Dang and Bardia, all are from Terai. Terai districts, including Dang (classified as Inner Terai) contribute 74.1% of the total milk production, while the remaining 25.9% comes from the six hill districts, with Palpa

being the largest producers among them. The average milk productivity per animal is estimated 854 litres annually, with buffaloes producing 860 litres and cows yielding 845 litres per year.

3.2 Cost and benefit analysis of dairy milk

3.2.1 Determinants of cost of dairy milk production

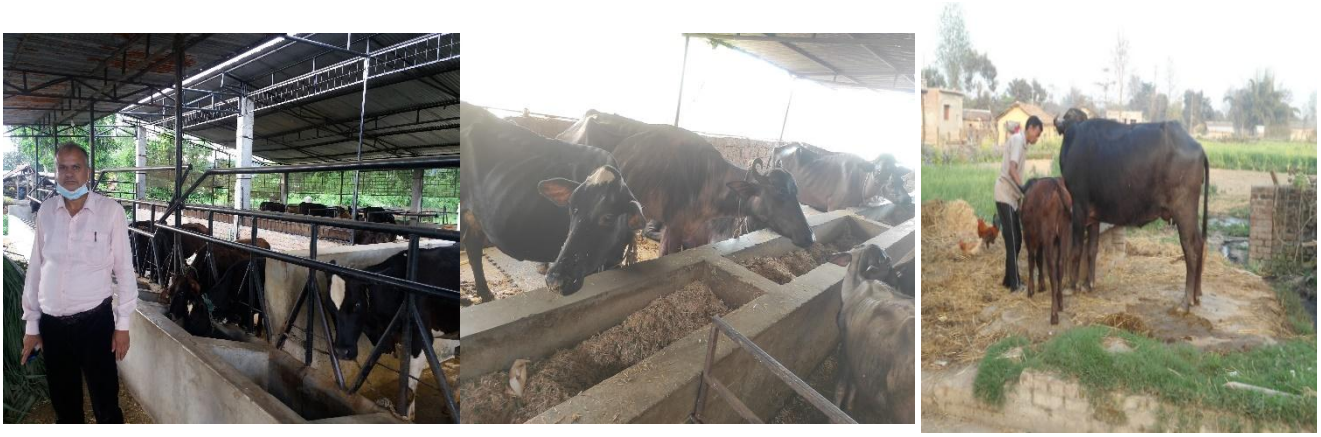
Age, farming experience and Education Level: Among the 75 sampled dairy farmers, the average age of the head of the households was 47.0 years, with a range of 28 to 68 years. On average, they had ≈ 10 years of experience in dairy farming. The majority of the respondents had completed SLC-level education (47.3%), followed by those with informal education (20.3%).

Farming category, breed usage: The study categorized dairy farms into threetypes: sub-commercial or small-scale farms (with 5 or fewer animals), semi-commercial farms (upto 10 animals) and commercial farms (more than 10 animals), based on number of livestock (Figure 2). The study visited both mixed farms, which included cows and buffaloes, and mono-dairy farms that are raising either cows or buffaloes. Of the farms visited, 24% were small-scale, 37.34% were semi-commercial, and 39% were commercial farms (Table 4).

Table 4: Dairy animal farming level in the study area

Types of farming	Category	Whole farm	Cow only	Buffalo only
Sub-commercial (small-scale)	5 or less animals	18 (24.00)	26 (46.43)	11 (33.34)
Semi-commercial	10 or less animals	28 (37.34)	20 (35.71)	13 (39.39)
Commercial	> 10 animals	29 (38.67)	10 (17.89)	9(27.27)
Total		75(100)	56(100)	34(100)

Note: Figure in bracket shows percentage as per total ***Source: Household survey FY 2080/81***



Commercial dairy farm in Lamahi Semi-commercial farm in Rupadehi Small-scale farm in Palpa

Photo 1: Types of farming: commercial, semi-commercial and small-scale

By analyzing number of animals, 33.34% of farms had dairy cows, 24% had dairy buffaloes and 29.33% had both cows and buffaloes. Regarding the breed types of these animals, 60% of farms raised improved breeds, 37% raised crossbreeds (mixed of improved and local), and approximately 3% kept only local breeds. However, farms that kept buffaloes had a higher promotion of improved breeds, with 100% Murrah for improved, and 50-75% Murrah for crossbreeds, along with some local breeds. For cows, only two breeds were reported: Holstein and Jersey, in a 70:40 ratio.

Types of feeding system: About 80% of farms practiced stall feeding, while only 3% of farmers adopted a free-range system, and 15% used a combination of both. Most commercial farms with improved breeds primarily used stall feeding. However, the free-range system was typically adopted for local breeds (such as Parkote and Lime buffaloes, and Madhesh local cows). The cost of feeding was relatively lower for those following free or combined systems, but free-range had some drawbacks. For example, it required a person for regular grazing, and movement reduced milk production, as reported by farmers in Marchawar (Rupandehi) and Buddhi (Kapilvastu).

Area of shed and fodder production and land types: To house their dairy animals, farmers used an average of 2.03 Kaththa (0.067 ha) of land for shed preparation, with a range of 0.25 to 15 Kaththa. For cultivating forage and fodder crops, the average land allocation was 3.95 Kaththa, with a range from 0.5 to 40 Kaththa. Less than 8% farmers used free-range system who had no land for growing fodders and they relied only on crop residues. About 37% of farms had lowland areas for fodder and forage cultivation (in Terai districts), while the remaining farms in the hills and Inner Terai had irrigated upland (49%) and un-irrigated upland (13%). Farmers' self-valuation of shed and forage coverage areas amounted to NPR 313.2 million, with an average value of NPR 4,232,094 (ranging from NPR 25,000 to NPR 7,500,000). This reflects the opportunity cost of land used for keeping dairy animals.

3.2.2 Fixed assets and their role in cost of production

"Table 5 presents the estimated fixed asset value, sum NPR 123.9 million, for fourteen major assets including sheds, vehicles, farm boundaries, cooling and chilling instruments, and more. The average investment per farm was NPR 1.67 million, with a median value of NPR 1.1 million. Among these assets, the top three largest capital costs were allocated for shed construction (59%), vehicles (14.5%), and farm boundaries (7%). Only a limited number of farms employed permanent staff or provided insurance for employees.

The study used the declining balance method to estimate depreciation for these assets. Based on the total investment, annual depreciation was estimated at NPR 13.6 million, which accounts for nearly 11% of the total investment.

Respondents also reported receiving NPR 5.6 million (an average of NPR 135,585 per farm) in subsidies, mostly as matching grants (covering around 50% of the cost) for new purchases or construction."

Table 5: Investment status in different types of fixed asset items

Types of Assets	Total Investment	Mean investment	Median	Min	Max	Share in cost
Types of capital Investment	**123903990**	**1674378**	**1010000**	**35400**	**14715000**	**100**
Dairy animal shed	72757000	983,203	600000	3000	6000000	58.72
Rent or revenue	1519250	25750	1500	100	500000	1.23
Water tank, pipes pump etc	3418230	89042	66500	9700	650000	2.76
Farm boundary	8336000	362000	125000	6000	5000000	6.73
Manger	7425800	151547	100000	1600	700000	5.99
Feed making machine	544000	90667				0.44
Chaff cutter	3128500	53940	35000			2.52
Link road, trails, hum pipes etc	380000	30000	37500	17500	137500	0.31
Local materials	960800	12984	5000	1500	200000	0.78
Cold chain (freeze)	1822000	75917	27000	25000	600000	1.47
Milking utensils	899160	12151	8000	1200	100000	0.73
Vehicles	17908500	447713	215000			14.45
Permanent staff cost	5974000	459538	0	70000	1800000	4.82
Staff insurance	20000	20000				0.02
Subsidy received in assets	5559000	135585				4.49
Yearly average depression	13547337	204350				10.93

Source: Household survey, FY 2080/81

3.2.3 Investment for types of dairy animal's shed preparation

Table 6 highlights three types of sheds used for housing dairy animals. Among the farms, 45% had improved or moderately scientific sheds, with an average investment of NPR 1.77 million. The estimated technical lifespan of these sheds was 23 years. Another 37% of farms used semi-improved sheds, with an average investment of NPR 0.43 million for their construction. The remaining 17.34% of farms housed their animals in traditional or unscientific sheds. The table also details the minimum and maximum investment levels, as well as average depreciation figures for each type of shed.

Table 6: Investment in different types of sheds and their estimated useful life

Types of sheds	Households	Total investment (Rs)	Average (Rs)	Minimum (Rs)	Maximum (Rs)	Depreciation used (Rs)	Avg. useful life (yeas)
Improved	34 (45.34)	60155000	1769,265	120000	6000000	80048	22.5
Semi-improved	28 (37.34)	11520000	426,667	100000	1400000	31554	15.3
Traditional	13 (17.34)	1082000	66833	3000	450000	5761	7.6
Total	75 (100)	72757000	98323	3000	6000000	117363	

Source: Household survey, 2081 (B.S)

3.2.4 Working assets and their role in cost of milk production

The second most important cost item was working assets, such as number of milking cows, buffaloes and fodder trees which were counted as standing assets used for more than one year. Table 7presents the working assets of 75 dairy farms, with a total estimated investment of NPR 72.8 million and an average investment of less than NPR 1 million per farm. Of this total, NPR 67.3 million was invested in dairy animals, with a substantial portion allocated to cows. Additionally, an average investment of NPR 26,992 was made in cultivating fodder trees for multi-year feeding of these animals.

Table 7: Working Assets/capital estimation

S.N.	Working assets	Total number #	Avg herd size #	Investment	Avg. investment	Remarks
1	Dairy animals total	**946**	12.61	**67287000**	**909,284**	
1.1	Milking buffalo	452	10.23	33777000	823,829	Crossand improved Murrah, local buffalo
1.2	Milking cow	494	9.15	37015000	685463	Jersey, Holstein
1.3	Depreciation of animals[1]			692855	49553	
2	Fodder trees cultivation			1997400	26992	Looping trees
3	Sub-total working assets			72789400	936276	
4	Fixed & working capital			193188390	2610654	
5	Share of working capital			37.68		

Source: Household survey, 2081 (B.S)

3.2.5 Variable costs of milk production

Purchasing disposable assets, such as feed, daily wage payments for labor, forage, and treatment, were considered variable or recurrent costs. The total estimated variable cost amounted to NPR 69.43 million, with an average of NPR 938,235 per farm (see Appendix13).

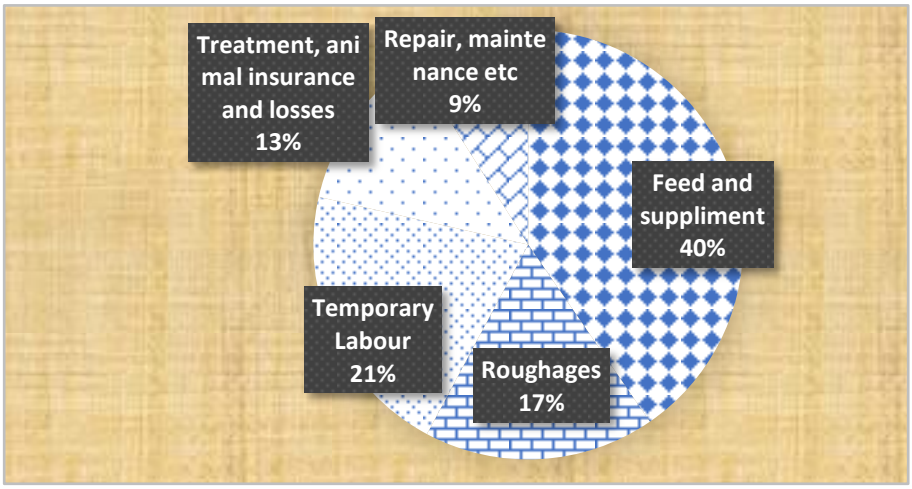


Figure 2: Variable cost composition in milk production

[1]Normally appreciation of milking animals takes place from 1st to 5thlactation period. However, majority of farmers did not purchase such quality milking animals and bought and milked these animals upto 20 lactation period. Therefore, depreciation method was used to measure their economic value in five lactation period.

Cost composition on a percentage basis, as shown in Figure 2, revealed that expenditures on feed and supplements, temporary labor, and roughage were 40%, 21%, and 17%, respectively. The lowest cost, at 9%, was for repair and maintenance and other minor items.

Within the feed and supplements category, homemade feed accounted for 94%, factory feed for 5.8%, and enzymes and vitamins for 0.2%. Temporary labor costs included family involvement (91%), hired labor (7%), and skilled labor (2%). Among roughages, the major sources were rice straw, green forages, and silage.

For the 75 farms analyzed, the total cost amounted to NPR 151.64 million, with an average cost of NPR 2.04 million per farm. The minimum and maximum cost expenditures ranged from NPR 284,878 to NPR 18,472,026, respectively.

3.2.6 Milk yield, productivity and income estimation

Table 8 illustrates the milk production and income patterns of dairy farms. Milk production was influenced by factors such as lactation period, type, and age of animals. The average lactation period was 8.5 months, with cows having an average of 9.2 months and buffaloes 7.4 months. Each farm produced an average of 125 litres of milk daily, with cow-only farms averaging 100 litres and buffalo-specific farms 95 litres. The average productivity per dairy animal was 9.88 litres/day, with cows producing 18% more milk (9.3 litres) than buffaloes.

On an annual basis, the average milk production per farm was 31.6 metric tons, contributing to a total of 2,338 metric tons of raw milk across all farms. Farmers earned NPR 2.33 million per farm, based on a price of NPR 79 per litre. Due to higher volume but moderate prices, mixed farm owners earned higher average incomes compared to farms focusing solely on buffalo or cows (see Table 11).

Table 8: Productivity and income of dairy animals in the study area

Particular	Unit	Buffalo	Cow	Mixed
Avg. lactation period	Month	7.4	9.2	8.5
Avg. milk production	Litre/day	95	100	124.6
Avg. milk productivity	Litre/day	9.3	10.93	9.88
Avg.raw milk production	Litre/year	20,684	26,971	31,591
Yearly raw milk production	Litre	8,27,340	15,10,380	23,37,720
Farm get price	Rs/Litre	87	73	79
Total income from milk	Rs	7,36,06,950	9,90,76,115	17,24,19,065
Average income	Rs	18,40,174	18,34,743	23,29,987

Source: Household survey 2080/81

3.1.7 Estimation of cost of milk production

Table 9 illustrates the estimation of per litre cost of dairy milk production (CoDMP), based on four socio-economic and demographic factors. Without accounting for other farm incomes, the CoP was estimated at NPR 65 per liter. When subtracting additional incomes such as those from manure, live animals, and grass (silage), the CoDMP was reduced to NPR 60.93/litre. The breakdown of costs was as follows:

- Working capital accounted NPR 30.34,
- Variable capital accounted NPR 24.24,

- Fixed capital accounted NPR 4.80.

Among the farms studied, those raising both cows and buffaloes had a CoP that was 23% higher compared to farms with cows only. This higher CoDMP in mixed farms was attributed to the greater working capital and fixed assets required to maintain both types of dairy animals.

Table 9: CoDMP and share of each component

Variables	Types of milk	Sample size	Mean ± standard deviation (NPR)	Median (NPR)	Variable cost (NPR)	Working capital (NPR)	Fixed asset (NPR)
Types of farm	Actual for whole farm[2]	75	64.82±19	61.7	29.7	29.34	5.8
	Whole milk	75	60.93±18	59.9	26.24±13	30.33±11	4.75±6
	Mixed farm (Cow and buffalo)	20	68.38	67.34	30.14	30.82	7.42
	Buffalo only farms	21	63.25	65.48	23.85	35.18	4.21
	Cow only farms	34	55.41	55.39	25.34	26.58	3.49
Geography	Terai only	55	61.81	60.88	26.71	30.23	5.5
	Hill only	20	58.88	58.98	24.81	26.64	3.07
Education	Uneducated	6	38.74	39.52	17.54	27.93	1.68
	Informal& primary	19	59.10	55.65	24.94	31.19	2.97
	SLC/SEE	35	62.31	61.61	26.87	30.51	4.92
	+2 and above	17	67.90	64.66	30.11	29.74	8.05
No. of animals	Small-scale	17	66.20	60.86	33.67	27.12	5.42
	Semi-commercial	28	55.58	53.95	23.59	29.08	4.11
	Commercial	29	62.83	60.89	24.43	33.42	4.98

Source: Household survey, 2080/81

By geography, the cost of production (CoP) for dairy milk in Hill districts was approximately 5% lower than in Terai districts. An unexpected result was observed in relation to the education level of household heads: farms managed by individuals with an education level of +2 or higher had a 43% higher CoP compared to farms managed by uneducated individuals. Regarding farm size, semi-commercial farms (with up to 10 animals) had the lowest CoP at NPR 55.58 per liter, compared to both commercial farms (with> 10 animals) and sub-commercial farms (with 5 or fewer animals).

Analyzing gross margin, net margin and benefit cost ratio of milk producers

The analysis of Table 10 provides insightful comparisons of gross margin (GM), net margin (NM), and benefit-cost ratio (BCR) across different types of dairy farms, geographic regions, education levels, and farm sizes. The following observations can be made:

[2] Actual cost of production (COP) was unadjusted price. In adjusted estimation, we subtracted other income of dairy farms by selling manure, live animals and silage grass.

Table 10: Gross margin, net margin and BCR of milk producers

Variables	Types of milk	Sample size	Mean gross margin (Total income – variable cost)	Mean net margin (GM- fixed capital-working capital)	Mean BCR
Types of farms	Whole farm	75	15,27,499	3,81,159	1.89
	Cow and buffalo mixed	20	19,26,613	2,04,249	1.36
	Buffalo only farms	21	13,93,522	514624	2.39
	Cow only farm	34	13,71,536	406716	1.58
Geography	Terai only	55	1602028	3,64,859	1.70
	Hill only	20	1343463	4,34,413	1.84
Education	Uneducated	6	1168375		3.39
	Informal and primary level	19	1561764		1.68
	SLC level	35	1168392		1.70
	+2 and above	17	2367445		1.38
No. of animals	Small-scale	17	4,52,600	73,781	1.45
	Semi-commercial	28	1033556	2,99,447	1.95
	Commercial	29	2634523	6,40,242	1.71

Source: Household survey, 2080/81

Based on types of farms: For whole farms case, estimated mean GM for all 75 farms was NPR 1,527,499, with an NM of NPR 381,159 and a BCR of 1.89. It means by investing one rupee, milk grower was earning NRs 0.89 as profit.The mixed farms, who was raising both cow and buffalo, had the highest gross margin (NPR 1,926,613), but their net margin dropped significantly to NPR 204,249, which could be attributed to higher fixed and working capital costs. The BCR of 1.36 suggests mixing animals were less efficient compared to others, possibly due to management complexity. On the other hand, buffalo only farms showed a robust performance with a GM of NPR 1,393,522 and the highest NM of NPR 514,624, resulting in an excellent BCR of 2.39. This implies buffalo farms were more profitable and efficient compared to cow or mixed-animal farms, largely due to higher milk prices. Likewise, with a GM of NPR 1,371,536 and an NM of NPR 406,716, cow-only farms demonstrated fairly moderate performance, with a BCR of 1.58. Their efficiency was higher than mixed farms but lower than buffalo farms.

Based on geography: Dairy farms in Terai districts reported a higher GM (NPR 1,602,028) compared to hill farms. However, their NM was lower (NPR 364,859) due to higher costs, resulting in a BCR of 1.70. The Terai's proximity to markets and better infrastructure might explain higher gross income but also leaded to higher costs. On the other hand, farms in the hilly district (Palpa) had lower GM (NPR 1,343,463), but exhibited a higher NM (NPR 434,413) and a BCR of 1.84, which indicated that dairy production in the hill regions was more cost-efficient. Lower production costs, such as land and feed, might contribute to this result.

By education: Surprisingly, farms managed by uneducated individuals reported the highest BCR of 3.39, even though their GM was comparatively lower (NPR 1,168,375). This might suggest that these farmers relied on traditional, low-cost farming practices, which resulted in higher efficiency. Farms managed by more educated individuals(+2 and above education level) had the highest GM (NPR 2,367,445), but they exhibited a much lower BCR of 1.38. This could be due to these farmers adopting more modern and costly techniques, leading to higher operating expenses but not necessarily proportionate increases in profitability. Farms managed by individuals with informal or primary education levels showed a moderate GM and BCR, indicating relatively balanced efficiency and profitability.

By farm size (number of animals): These Small-Scale Farms (≤5 animals) had the lowest GM (NPR 452,600) and NM (NPR 73,781), with a BCR of 1.45. While they were profitable, their limited scale resulted lower returns. Semi-Commercial Farms (6-10 animals) on the other hands displayed a good balance between GM (NPR 1,033,556) and NM (NPR 299,447), achieving the highest BCR (1.95). This indicated that semi-commercial farms had the most optimal scale, with lower costs and higher returns. The Commercial Farms (>10 animals) illustrated the highest GM (NPR 2,634,523) and NM (NPR 640,242), but their BCR (1.71) was lower than semi-commercial farms, possibly due to higher costs associated with scaling up production.

3.2.8 Milk marketing status and its impact on gross margin and benefit cost ratio

Intermediaries involved in milk marketing were collectors, transporters, processors, wholesalers and retailers. By organization, those intermediaries were Dairy Development Cooperation (DDC), dairy cooperatives, agricultural cooperatives, private dairies and vendors, which were handled 517 Mt milk (173 Mt cow mik and 343 Metric ton buffalo raw milk). About 30% of milk was used for individual household and unorganized selling (self-sell from home, hotels, restaurants) and rest 70% milk was sold from three different marketing channels: Farmers->Cooperatives->DDC-> Cooperatives/Private Dairies->consumers, Farmers-> Cooperatives ->Consumer, and Farmers->private dairies/vendors ->consumers. Among these, marketing through **Farmers->Cooperatives->DDC->Cooperatives/Private Dairies->consumer** channel was largely followed in Lumbini province because of two large processing plants of Dairy Development Cooperation (DDC) called Kohalpur Milk Supply Scheme and Lumbini Milk Supply Scheme. Farmers collected raw milk to collection centres, priced based on **Fat and SNF content,** that milk was processed there via chilling vat, brought to DDC offices. FGDs in Palpa (Dumre Dairy Cooperatives), Kapilvastu (Milijuli Dairy Cooperatives and Bandaganga Dairy Cooperatives) Rupandehi (Radhakrishna Dairy Cooperatives) and Nawalparasi West (Swathi Krishi Sahakari)revealed farmers were received varied price rate for same quality milk. They had also faced policy related or local problems during production and selling process. These cooperatives sold variety of dairy products such as chilled milk, yoghurt, ghee, cream, butter milk, khowa, cheese, paneer and bottled items for local consumers.

	
FGD with Dumre Dugdha Krishi Sahakari, Palpa	FGD discussion with Milijuli Milk Cooperatives and Bandganga, Dairy Cooperatives, Kapilvastu

Photo 2: Milk production and marketing discussion with dairy cooperatives

Farmers income affected by Lean and flush season's milk price: FGD and KII interviews highlighted the seasonal fluctuation in milk production, with a flush-to-lean season ratio of 3:1 in Rupandehi, 2:1 in Dang, and 2.5:1 in Banke. During the flush season (August-February), there was a 30-60% milk surplus, while the lean season saw a 50-100% deficit. Factors such as buffalo breeding patterns, availability of green forage, and favorable weather contributed to increased milk production in the flush season. Lean season's milk shortage was partially addressed by using milk powder and imports.

Informal import in the bordering districts has affected milk producers of Terai and Hill farmers.

Milk's pricing and payment modality and Farmer's Net Margin and BCR: In Lumbini Province, milk prices were determined by DDC based on total solids (TS), including fat and SNF (Solid Non-Fat), a practice aligned with international standards. Buffalo milk with 6.6% fat and 8% SNF was priced at NPR 72.8 per liter, calculated using rates of NPR 6.68 for fat and NPR 3.6 for SNF. Higher fat and SNF content results in higher payments per liter. Milk quality fluctuates daily, affecting price at the buyer's gate. Additionally, commissions for forwarding buyers (cooperatives, firms, etc.) were 20% in the morning, 25% in the evening, and 30% for chilled milk. A sample from Bandganga Dairy Cooperative showed that cow milk producers earned NPR 64.54/liter (range NPR 54-70), buffalo milk NPR 94.57/liter (range NPR 79-120), and mixed milk NPR 80.34/liter (range NPR 75-90). Cow-only farms earned 20% above their cost of production (CoP), mixed farms 24%, and buffalo-only farms 33%.

Payments in the formal sector, especially for DDC, typically made monthly, though private dairies may offer 15-day intervals. However, due to DDC's financial crisis, payments were delayed by 6 months to a year, pushing some farmers toward direct marketing or private dairies, though many still relied on same supply chain.

3.2.9 Production and marketing constraints of milk producers

The study employed a quasi-descriptive method to analyze the factors affecting the cost of production (CoP) of dairy milk. The Veterinary Hospital and Livestock Service Knowledge Centre

(VHLSKC) operated in every district of Lumbini province, providing a range of extension services. These included onsite technical assistance, subsidies for capital assets, animal treatment clinics, training, and exposure visits for dairy farmers. Additionally, there were livestock insurance schemes supported by the federal government, along with small-scale support programs from local government offices in each rural municipality. Despite these efforts, dairy farmers still faced significant challenges. Table 11 ranks these problems using a Likert scale of 1 to 5, where 1 indicates no problem and 5 represents an acute problem.

Table 11: Ranking major problems that affectedCoDMP

Types of problems	Acute problem	Important problem	Moderate problem	Low problem	No problem	Index rank	Rank
Expensive milking cows and buffaloes	25	22	16	12	0	3.80	I
Poor technical and financial supportwith poor extension services	36	9	13	10	7	3.76	II
Problem of fodders, insufficient land for raising nutritious forage and fodder trees	10	14	15	26	10	2.84	III
Unscientific animal keeping system	11	13	13	21	17	2.73	IV
Getting trouble of getting subsidized loan and no grace period considered for loan payment.	9	14	10	21	21	2.59	V
High labour cost and unavailable of staff for dairy works	9	12	11	20	23	2.52	VI

Source: Field Survey, FY 2080/81

Based on respondent rankings, "expensive milking cows and buffaloes" was identified as the top problem with an index rank of 3.80. This issue was consistently highlighted in our FGDs and KIIs across study areas. Key factors contributing to high costs include:

1. **High demand of milch breeds:** Farmers preferred to buy high-quality breeds like Murrah buffaloes and Holstein and Jersey cows. Local Resource Centres in Rupandehi, Dang, and Palpa were unable to meet the growing demand, leading to price increases.
2. **Rising Prices:** Calculated average price for buffaloes and cows was NPR 80,467 and NPR 89,840, respectively, but prices have surged to NPR 150,000 due to informal supply sources. Expensive breeds raise working capital and subsequently increase milk's cost of production.
3. **Inadequate domestic supply:** With no government farms supplying heifers or calves, informal supply mostly from India lacked price and quality regulations.
4. **Health issues and genetic erosion:** Problems like repeated estrus, infertility, and mastitis leaded farmers to sell affected animals for meat, contributing to genetic erosion of improved breed.
5. **Shrinking herd sizes:** Migration for employment and family relocation to urban areas was causing a reduction in herd sizes, impacting commercialization and semi-commercialization.

The second-ranked issue, with a score of 3.76, was "Poor technical and financial support, including inadequate extension services, high animal mortality, and low insurance coverage. Despite of extension services of Veterinary Hospital and Livestock Service Knowledge Centre (VHLSKC), and local government offices, dairy farmers reported inadequate support. Two key issues were identified:

- Increased animal mortality due to poor service from experts, who are overwhelmed by administrative tasks and unable to provide essential clinical services, artificial insemination, vaccination, and management support. Farmers faced large loss due to Lumpy skin disease, FMD in cow and internal paradise like liverfluke, mastitis problem in both milking cows and buffalos.
- Existing technical experts were often occupied with paperwork related to grants and subsidies, which detracts from their fieldwork.
- Our survey showed that the average investments needed for dairy operations were NPR 1,673,278 for fixed assets, NPR 909,284 for working assets, and NPR 938,235 for variable costs. Thus, a dairy entrepreneur raising 12 animals required about NPR 3.6 million in investments, including NPR 1 million annually for operations. Discussions revealed that government funding (both provincial and local) was imbalanced, with inadequate support across essential areas like feed, breed, health, housing, and marketing. Input-based subsidies reached only 8% of dairy farmers, with some reporting corruption and inefficiencies in the subsidy distribution. Direct purchases from suppliers were often cheaper than subsidized tools.
- Farmers reported inadequate insurance coverage, drudgery to getting loss claim and denies doing animal insurance.
- Production-based subsidies per liter of milk did not cover all dairy farmers. Only a few cooperatives and firms were benefiting from it.

The third-ranked problem, with an index score of 2.84, was “Problems with fodder, insufficient land for raising nutritious forage and fodder trees.” Data from the household survey showed that the average allocation of land for fodder cultivation was 3.95 Kaththa, ranging from 0.5 to 40 Kaththa, which was low relative to the average herd size. Our group discussions revealed that:

1. Dairy farms near city areas, such as in Butwal Bazaar and Dumre (Palpa), faced troubles in obtaining suitable land at reasonable prices. They shifted from fodder to feed-based systems due to increased land prices (both leasing and purchasing), which raised their cost of milk production.
2. Farmers, who used a free-range system and provided homemade feeds partially, received less milk and faced higher production costs,.
3. One-third of farms did not allocate quality land for fodder cultivation. Their production costs increased when cultivating fodder on un-irrigated or marginal land.
4. Dairy entrepreneurs either did not receive training or ignored best practices for growing leguminous and non-leguminous fodder and feeding ratios. About one-third of dairy entrepreneurs did not recognize the need for fodder crops and grass for their livestock.

The fourth problem, with an index score of 2.73, was “Unscientific animal-keeping systems.” About 54% of farms, which used semi-improved and traditional sheds, were technically unsuitable for keeping dairy animals (see Table 7). Our field discussions revealed that:

1. Small-scale and semi-commercial dairy farms were low profitable, making it difficult to invest Rs. 1,700 per square foot in scientific shed preparation. Despite their financial constraints, they could not afford additional investments in shed improvements. The partial support available

from provincial and local governments was insufficient to encourage the construction of scientific sheds.

2. Poorly managed farms reported issues with infertility and repeated estrus cycles in 30% of cows and 40% of buffaloes. These problems were particularly prevalent among farms using AI-focused breeding for improved buffaloes and cows, significantly increasing the cost of production.

The fifth problem, with an index score of 2.59, was related to availability of subsidized loan and no grace period was considered for interest payments."One-third of respondents reported this issue as important for raising their cost of production (CoP) because of regular interest payments. Additionally, no banks and financial institutions considered "a grace period for loan payment necessary for dairy commercialization, which typically takes at least three years to become profitable.

High labour cost and unavailability of experience staff for dairy work was 6th major problem.

Top five **marketing constraints** ranked by farmers that were hindering gross margin and benefit cost ratio were:

- **Delay payments by the local cooperatives:** It was the foremost trouble of farmers of receiving money because of payment was pending for long period of time by dairy cooperatives who sold milk to DDC. Even private dairies delayed their payments
- **Informal milk and dairy product flow from bordering India:** Some private dairies and vendors (locally called Dudhiya) who had dumped low priced milk from India and sold it daily in major cities such as Bhairahawa, Butwal, Parasi, Gulariya, Nepalgunj. It had distorted both supply chain and price
- **Unreliable marketing outlets:** Since DDC shrunk it buying milk, it had created trouble to search other reliable marketing outlets.
- **Low milk price:** Farmers felt inadequate farm-get price because of rising cost of production.
- **Low skill for preparing long-life milk and dairy products:** Mainly local cooperatives were unprofessional to prepare long-duration products of unsold milk.

PART 2: COST OF PRODUCTION ANALYSIS FOR GOAT MEAT

3.3 Goat farming background and statistics in Lumbini Province

Goat farming is one of the most popular income-generating enterprises for 24.52 million Nepalese (NSO, 2024). Lumbini Province contributes 18% of total holdings, 17% of total goat numbers, and 14% of improved goat-keeping, with 440,806 holdings raising 2.37 million goats (Table 12). Local goat keeping accounts for 96% of total goat raising. The largest share of improved goat-keeping is reported in Nawalparasi West (8.1%) and Rupandehi (6.9%). In terms of holdings, Dang, Rupandehi, Bardia, Gulmi, and Pyuthan are the top five districts involved in goat rearing. Dang, Rupandehi, Palpa, Pyuthan, and Rolpa are the top five districts with the highest number of goats.

Table 12: Number of holdings, goat number and sharing of goat

District	Numbers of holdings keeping goat	Total goat number	Local goat number	Improved goat	Share of improved goat
Rukum East	5871	36619	36289	330	0.9
Rolpa	37091	229003	221203	7800	3.4
Pyuthan	40012	238171	232086	6085	2.6
Gulmi	41359	204872	199439	5433	2.7
Arghakhanchi	33150	180154	177007	3147	1.7
Palpa	35128	241495	233793	7702	3.2
Nawalparasi West	23625	113921	104718	9203	8.1
Rupandehi	49563	247604	230601	17003	6.9
kapilvastu	34504	151650	150831	819	0.5
Dang	60240	348866	340284	8582	2.5
Banke	32215	154534	149681	4853	3.1
Bardia	48048	224092	218487	5605	2.5
Sub-total	**440806**	**2370981**	**2294419**	**76562**	**3.2**
Nepal	2451583	14242156	13702078	540078	**3.8**
Share of Lumbini Province	18	17	17	14	

Source: NSO, 2024: page 216-218

Meat production from various animal sources has been compared over the last decade (2011/12 to 2021/22). In the base year 2011/12, goat production in Lumbini Province was 9.51 million, with approximately 5.67% used for chevon production, totaling 539,556 Mt. Among other meat sources such as buffalo, pork, chicken, duck, and mutton, chevon's share was around 19% (Table 13). The average growth rate of chevon production was 3.3%. In 2021/22, buffalo remained the major source of meat, while chevon's share decreased to 15%, with a production of 74,241 Mt. Data show that the average annual growth rate of goat numbers is increasing by 3.3%, reaching 14 million goats in Lumbini Province (MoALD, 2023).

Table 13: General statistics of goat meat (Chevon) and other sources in Lumbini Province

Fiscal year	Buff	Pork	Chicken	Duck	Mutton (Ship)	Goat (Chevon) Mt	Growth rate of goat meat	Total Meat (Mt)	Share of goat meat
2011/12	172414	18277	40346	217	2720	53953	-	287927	18.74
2012/13	175132	18709	42810	217	2721	55578	3.01	295167	18.83
2013/14	173906	19269	43133	227	2656	59053	6.25	298244	19.80
2014/15	174012	20135	45458	232	2658	60906	3.14	303401	20.07
2015/16	175005	23509	55041	237	2684	65583	7.68	322059	20.36
2016/17	180080	24535	57268	241	2717	67706	3.24	332547	20.36
2017/18	185180	28214	60122	280	2754	70802	4.57	347352	20.38
2018/19	188574	28579	62899	353	2763	73914	4.40	357082	20.71
2019/20	189517	29493	255001	387	2735	75023	1.50	552156	13.59
2020/21	188172	31450	226959	442	2964	70755	-5.69	520742	13.59
2021/22	194090	36059	204923	596	2880	74241	4.93	512789	14.48

Source: MoALD, 2023

3.3 Estimaton of cost of goat meat production

Before determining the cost of goat meat production (CoGMP), the study analyzed the following socio-economic characteristics of goat farmers. Although the study collected 75 samples, one sample was excluded from the cost analysis due to its focus on breeding

3.3.1 Determinant of cost of goat meat production

Age, farming experience and education level: Within the 74 samples, the age of goat-keeping farmers ranged 26 to 72 years, with an average 46.63 years. The majority of the respondents had primary level education (37.3%) followed by SLC/SEE (32.3%) and illiterate (17.3%). The average goat farming experience was10.23 years, ranging from 3 to 30 years.

Farm size, feeding system and breed types: At first, the study categorized three types of farming: small-scale, also called sub-commercial or subsistence farming, with 19 or fewer goats (doe, kids and intact); semi-commercial farming, with 20 to 49 goats; and pure commercial farming, with ≥ 50 goats. Based on number of animals, study estimated 35%, 50% and 15% as commercial, semi-commercial and small-scale farms, respectively (Table 14).

Table 14: Farming types with feeding system and breed types

Types of farming[3]	Size of animals	Feeding system (%)			Breed types (%)			Sub-total
		Install feeding	Both	Free range	Improved	Cross	local	
Commercial	>50	28.4	4.1	2.7	1.4	32.4	1.4	35.1
Semi-Commercial	20-49	9.5	25.7	14.9	9.5	31.1	9.5	50.0
Small-scale	≤19	1.4	1.4	12.2	2.7	0.0	12.2	14.9
Total		39.2	31.1	29.7	13.5	63.5	23.0	100.0

Source: Field survey 2080/81

[3] Farming categories were taken reference from technical officer of Directorate of Livestock and Fishery Development, Lumbini Province.

Feeding systems included three categories: *Install feeding* (full feeding provided), *both* (partial feeding and grazing), and *free range* (grazing only). Commercial farms predominantly used install feeding (28.4%), while semi-commercial farms relied more on mixed feeding (25.7%), and small-scale farms mainly use free-range feeding (12.2%).

Breed types were divided into *improved*, *crossbreed*, and *local*. Crossbreeds were most common in commercial (32.4%) and semi-commercial farms (31.1%), while small-scale farms mainly used local breeds (12.2%).

Goat shed types for farming size: Table 15 categorizes goat farming based on the type of shed used-traditional, semi-improved, and improved-across three farming types: commercial, semi-commercial, and small-scale. The commercial entrepreneurs predominantly used improved sheds (16.22%), with some using semi-improved sheds (13.51%) and fewer used traditional sheds (5.41%). Likewise, semi-commercial entrepreneurs mainly relied on semi-improved sheds (31.08%), followed by traditional sheds (14.86%) and minimal use of improved sheds (4.05%). Finally, small-scale farmers used traditional sheds (13.51%) and had limited adoption of semi-improved sheds (1.35%), with no usage of improved sheds.

Table 15: Types of goat shed used according to farming types

Types of farming	Traditional	Semi-improved	Improved	Sub-total
Commercial	5.41	13.51	16.22	35.1
Semi-commercial	14.86	31.08	4.05	50.1
Small-scale	13.51	1.35	0.00	14.9
Total	33.78	45.95	20.27	100

Source: Field survey FY 2080/81

3.3.2 Types of fixed assets and their share in CoGMP

Table 16 illustrates the major fixed assets and their share in the goat farming investment. The total investment in fixed assets amounted to NPR 38.4 million, representing 67.8% of the fixed and working capital, and 46% of the total cost. The average investment per farm was NPR 518,857, ranging from NPR 9,400 to NPR 11.5 million.

The sheds had the largest share, accounting for 35% of the fixed and working capital and 23% of the total cost. Among the three types of sheds, improved sheds contributed 19.1%, followed by semi-improved sheds at 14.2%. On average, 1.12 Katha of land (or a total of 2.9 hectares) was used to construct these sheds. For land used for shed and forage production, approximately 1.3% of fixed assets or average of NPR 10432 paid as land rent plus revenue.

The second and third most expensive investments were farm boundaries, accounting for 14.0% of the fixed assets, and vehicles, which made up 5.7%. Smaller investments were made in dipping tanks, local tools, and feed-making devices, each contributing less than 2%.

Table 16: Types of fixed assets, investment and share in fixed and total cost

S.N	Types of fixed assets	Total investment (NPR)	Average	Minimum investment (NPR)	Maximum Investment (NPR)	Share in fixed +working capital (%)	Share in total cost (%)
1	**Shed**	**19609500**				**34.6**	**23.4**
1.1	Improved	10850000	723333	300000	2500000	19.15	12.95
1.2	Semi-improved	8022500	235956	82500	500000	14.16	9.57
1.3	Traditional	737000	29480	4000	105000	1.30	0.88
2	Land rent	763240	10432	100	450000	1.35	0.91
3	Dipping tank	700000	116667	30000	500000	1.24	0.84
4	Farm boundary	7930000	283214	10000	6000000	14.00	9.46
5	Water management	1615000	67292	10000	500000	2.85	1.93
6	Tatno including feeding devices	1894500	49855	2500	250000	3.34	2.26
7	Feed making devices	334000	66800	35000	70000	0.59	0.40
8	Trail & electrification	50000	50000	50000	50000	0.09	0.06
9	Local tools	688300	9301	800	200000	1.21	0.82
10	Vehicle	3249500	203094	7000	1500000	5.73	3.88
11	Permanent staff	948000	189600	100000	360000	1.67	1.13
	Total	38395400	518857	9400	11456000	67.76	45.82

Source: Field survey 2080/81

3.3.3 Types of working assets used for goat keeping

Goat-keeping size and composition: Table 17 presents data on the composition and valuation of different types of working assets used in goat-keeping operations. Farmers had 3565 goats including doe, intact and kid, with average of 48 in numbers. Out of that, a total of 2,854 does were accounted for, with an average of 39 does per farm, ranging from 6 to 358 across farms. The number of kids (young goats) totaled 339, with an average of 5 per farm, and the number of kids per farm ranged from 1 to 22. After sell or ready to sell up to July 2024, farmers reported that they had stocked 1,940 goats and an average of 26 per farm, ranging from 4 to 350. The net doe (yearly -stocked) analyzed was 1,253 for costing purposes, averaging 17 per farm, with a range of 2 to 159. Likewise, net intact (he-goats) analyzed for cost was 372 numbers, with an average of 5 per farm, ranging from 1 to 58.

Table 17: Goat-keeping size and valuation

S.N	Working asset types and valuation	Sum	Average	Min	Max	Share in fixed cost (%)	Share in total cost (%)
1	Doe #	2854	39	6	358		
2	Kids #	339	5	1	22		
3	Remaining flock #	1940	26	4	350		
4	Net doe analyzed for costing #	1253	17	2	159		
5	Net intact analyzed #	372	5	1	58		
6	Valuationof doe (NPR)	12157200	164286	18000	18000	21.5	14.5
7	Value of intact (he-goat)	4464000	60324	12000	696000	7.9	5.3
8	Expenses for Fodder tree plantation	1646450	22249	1400	100000	2.9	2.0
Total of row (6,7,8)		18267650	246860	32600	3257000	32.2	21.8

Source: Field survey, 2080/81

Regarding to investment in working capital and share in costs, study valued for three assets including does, he-goats, and fodder tree plantations which amounted to NPR 18,267,650, with an average investment of NPR 246,860 per farm. The breakdown of investments is also shown in Table 18. The total estimated value of does was NPR 12,157,200, with an average investment of NPR 164,286 per farm, ranging from NPR 18,000.0 to NPR 1,800,000.0. The investment for she-goat (doe) purchasing accounted for 21.5% of the fixed cost and 14.5% of the total cost. Likewise, total value of intact(he-goats) was NPR 4,464,000, with an average investment of NPR 60,324 per farm. The value ranged from NPR 12,000 to NPR 696,000. Investment in he-goats represented 7.9% of the fixed cost and 5.3% of the total cost. Thirdly, expenses related to fodder tree plantation amounted to NPR 1,646,450, with an average of NPR 22,249 per farm. These expenses ranged from NPR 1,400 to NPR 100,000 and contribute 2.9% of the fixed cost and 2.0% of the total cost. Together, these three categories of working assets-does, intact he-goats, and fodder plantations-account for 32.2% of the total fixed cost and 21.8% of the total cost involved in goat-keeping operations.

3.3.4 Types of items considered for variable cost estimation and their share

Table 18 outlines the major components of variable costs of goat meat production (VCoGMP).The total variable costs estimated NPR 27,127,309.0 with an average farm spending NPR 366,585 on disposable assets purchasing. These variable costs contributed 32.38% of the total cost of goat farming. However, net variable cost used for analysis was NPR 9,110,909 (66.4% of total) with an average of NPR 123,120 per farm, ranging from NPR 2,300 to NPR 467,080. It is because that 43.6% of total variable cost was covered by extra income such as goat manure, grain (maize) harvested from forage land, kids and old doe sale throughout the year.

The largest cost item was labour costs, study estimated NPR 13,898,850, with an average investment of NPR 187,822 per farm by including cost of family labour, casual hired labour and skilled expert. Labour represented 51% of the variable costs and 17% of the total costs. Goat farming had been employing family members for about 7.2 hours in a day and its contributed about 98% share within labour cost component.

The second important component of variable cost was feed and supplement costs, with a total investment of NPR 9,802,215. The average farm spent NPR 193,460 on feed, with expenditures ranging from NPR 200 to NPR 974,625. It accounted 36.13% of the total variable costs and 11.70% of the total costs of goat farming. Farmers fed about 272.9 Mt feed, with an average of 3.7 Mt per family or @73.2 kg in a year or 200 gm per day for each goat. Out of total sources, about 98% was sourced from local materials such as grains, rice bran, Choker and soybean and share of local grains (maize, millet, paddy was 76%. Of the total, about 1.98% expenditure spent for buying supplements such as minerals block, vitamins, and enzymes.

Table 18: Types of items considered for variable cost estimation and their share

S.N	Types	Sum of investment	Average investment	Minimum investment	Maximum investment	Share in variable cost	Share in total cost
1	Feed and supplement	9802215	193460	200	974625	36.13	11.70
2	Grass and forage seed cost	1100860	19313	800	295000	4.06	1.31
3	Labour cost	13898850	187822	8000	737800	51.24	16.59
4	Goat treatment, losses, premium cost etc	644155	8704	400	43000	2.37	0.77
5	Other cost (tax, electricity, interest, transport, communication	1694799	22903	800	598600	6.25	2.02
	Sub-total	27127309	366585	108650	2622025	100.00	32.38
	Net variable cost taken into analysis	9110909	123120	2300	467080		

Source: Field survey, 2080/81

The cost of grass and forage seeds amounts to NPR 1,100,860, with an average investment of NPR 19,313 per farm, ranging from NPR 800 to NPR 295,000. This represented 4.06% of the variable costs and 1.31% of the total costs. These grasses were mostly seasonal such as maize, vetch, Oat, Teosinte, Bhatmase, Berseem, stylo and so one which were planted in 4.7 *Kaththa* land. One farm was even expanded upto 200 *Kaththa* (6.7 ha) for fodder and forage seed production, including natural grazing. This cost included fodder seed, farming, purchase of roughages such as hay, silage and straw purchase.

Farmers also incurred expenses related to goat treatment, losses, and insurance premiums, with a total of NPR 630,585. The average farm spent NPR 8,521 on these items, with a range of NPR 400 to 43,000. These costs accounted for 2.32% of the variable costs and 0.75% of the total costs.

The other miscellaneous costs included repair and maintenance, electricity, bank's interest, transport, communication and tax amount to NPR 1,694,799, with an average investment of NPR 22,903 per farm, ranging from NPR 800 to NPR 598,600. These costs represented 6.25% of the variable costs and 2.02% of the total costs.

3.3.5 Yield, productivity and income estimation for goat farming

Table19compares the sales, meat productivity, income, and benefit-cost ratios for whole samples including three types of goat farms: commercial, semi-commercial, and small-scale.

Table 19: Sales, meat productivity, income and benefit cost ratio

particular	Unit	Whole farm average (n= 74)	Commercial goat farm (n= 26)	Semi-commercial goat farm (n=33)	Small-scale goat farm (n=11)
Avg. goat herd size	Number	48	88	30	14
Avg. sale of intact &castrated he-goats	Number	15	27	9	4
Sales over raising goats	%	30.43	30.93	29.27	31.54
Amount of goat meat (live form)	Mt	42.5	28.1	12.7	1.8
Average meat	Kg	575	1081	342	161
Meat productivity (live form)	Kg/animal	38	40	39	38
Avg. cost of production	NPR/Kg	417	369	432	477
Avg. cost of raising	NPR/goat	5437	4980	5495	6325
Average farm-receive price	NPR/kg	581	582	590	571
Total income from meat sale	NPR	24140050	15828450	7302800	1008800
Avg. income from meat sale	NPR	326217	608787	197373	91709
Extra income from sales of diversified goat products	NPR	17901300	11171050	5796300	933950
Avg. extra income from sales of diversified products	NPR	241909	429656	156657	84905
Total income (calculated)	NPR	42041350	26999500	13099100	1942750
Averaged income (calculated)	NPR	568126	1038442	354030	176614
Avg. gross margin (income - variable cost)	NPR	201358	409845	105849	29830
Avg. net margin (Income - total cost)	NPR	100532	211754	47401	16358
Benefit cost ratio (Depreciated capital case)	Ratio	2.17	2.37	2.11	1.90
Benefit cost ratio (Undepreciated capital case)	Ratio	1.49	1.49	1.47	1.56

Source: Field survey, 2080/81

Farmers reported that they sold 15 intact and castrated he-goats in a year. In districts of Lumbini province, dominant farms sold he-goat these days over castrated he-goat because of high demand of meat, breeding, and religious purpose. Commercial farms sold 27 goats on average, while semi-commercial farms sold 9 and small-scale farms sold 4. Of the percentage of goats sold relative to total production, small-scale farms reported the highest sale rate (31.54%), while semi-commercial farms had the lowest (29.27%) of total keeping herd. Yearly sale depended on number of herd size, health condition of animal and economic farmers. Commercial farms have the largest flocks (88), followed by semi-commercial farms (30) and small-scale farms (14). That sold animals were calculated in terms of meat production. Commercial farms produced the most (28.1 Mt), with small-scale farms producing the least (1.8 Mt).Commercial farms produced the most meat (average 1081 kg), while small-scale farms produced 161 kg**.** Meat productivity per animal was 38 kg based on

live form. Among farms, commercial farms had a productivity of 40 kg/animal, semi-commercial farms 39 kg/animal, and small-scale farms 38 kg/animal.

Avg. cost of producing one kilogram of goat meat was NPR 417.0. Small-scale farms had the highest production costs (NPR 477/kg), while commercial farms had the lowest (NPR 369/kg). Likewise, average cost of raising one goat was 5437. Small-scale farms incurred the highest costs (NPR 6325/goat), and commercial farms had the lowest (NPR 4980/goat).

The average price received by farmers per kilogram of goat meat sold was NPR 581.0, ranging from NPR 420 to 800 depending on age and types of products sold. Semi-commercial farms received the highest price (NPR 590/kg), while small-scale farms received the lowest (NPR 571/kg).

Study estimated NPR 42.04 equivalent amount as total income of goat farms by including both meat and diversified products. Commercial farms generated the most (NPR 26,999,500), while small-scale farms generated the least (NPR 1,942,750). In case of meat income (total and average) was based on per kilogram income. Farmer reported NPR 24.14 million income annually by selling 425 mt equivalent of intact and castrated he-goats**.** Commercial farms generated the most (NPR 15,828,450) or (average NPR 608787) and small-scale farms generated the least (NPR 1,008,800 or average Rs 91,700. Combining all sales, overall average income per farm was NPR 5,80,126, Of which, commercial and semi-commercial farms had nearly six times and two times higher average income in comparison to small-scale farms (NPR 176,614).

Extra income included sales of diversified goat products mainly kids for keeping, kids or large sized he/she-goat for worshiping god and goddess, manure, old-doe, grain or set income together with grass (Napier, maize) cultivation and income of remaining herd. We included those products into analytical framework because of involving cost for all types of goat-keeping. Commercial farms earned the most (NPR 5,796,300), and small-scale farms earned the least (NPR 933,950).Commercial farms had the highest average (NPR 429,656), while small-scale farms earned the least (NPR 84,905).

Gross margin (GM), subtracting variable cost from gross income, was estimated goat farms' economic viability. How many goat farms had surplus income more than recurrent cost? Study estimated NPR 201358.3 as average gross margin, ranging from NPR 9240 to 21,76,225. Further, commercial farms had the highest gross margin (NPR 409,845), while small-scale farms had the lowest (NPR 29,830).

Another, economic indicator was net margin, also called net profit which subtracts fixed cost from gross margin, was NPR 100532.3, in a range of NPR -57271.0 and 7,02,081. Commercial farms had the highest net margin (NPR 211,754), while small-scale farms had the lowest (NPR 16,358). Unpleasantly, four semi-commercial farms had negative net margin.

The farm financial indicator, Benefit-Cost Ratio (BCR), was estimated by calculating depreciation, or without it. Average BCR was 1.49 for undercoated capital assets, and 2.17 for depreciated capital assets. Commercial farms had a ratio of 2.37, meaning for every 1 NPR spent, 2.37 NPR was earned, with semi-commercial at 2.11 and small-scale farms at 1.90. The benefit-cost ratio was estimated without considering depreciation. In this case, small-scale farms had a slightly higher ratio (1.56) than commercial (1.49) and semi-commercial farms (1.47).

3.3.6 Analysis for cost of goat meat production

Table 20 presents the cost of goat meat production (CoGMP) across different types of farms, comparing whole farm averages, commercial, semi-commercial, small-scale farms, and farms in Hilly and Terai districts. This data reflects how farm scale and geographical location impact the cost structure of goat production.

Cost for raising a goat: The average cost of raising a goat across all farms was NPR 5,437±2055 under depreciated fixed and capital cost condition. However, commercial farms had the lowest cost

at NPR 4,980, while small-scale farms faced the highest cost at NPR 6,325. In the Hilly districts, the cost was NPR 5,313, and in the Terai districts, it was NPR 5,480, with 3% higher than hilly districts.

Table 20: Cost of production of goat meat for different conditions

Cost particulars	Whole farm (NPR)	Commercial farm (NPR)	Semi-commercial(NPR)	Small-scale farm (NPR)	Hilly Districts (NPR)*	Terai districts (NPR**
Cost for raising a goat	5437	4980	5495	6325	5313	5480
Cost of production of Meat	417	369	432	477	449	405
Share of variable costs	260	205	261	388	260	260
Share of working assets	77	74	85	57	87	73
Share of fixed assets	80	89	87	33	102	72

* Hilly districts include Arghakhanchi and Palpa districts

** Terai districts include Banke, Kapilvastu, Nawalparasi West and Rupandehi

Source: Household Survey 2080/81

CoGMP (NPR): The average cost of producing 1 kilogram of goat meat was NPR 417.Commercial farms had a lower production cost at NPR 369, while small-scale farms experienced a higher cost of NPR 477 per kg. The cost was NPR 449 in Hilly districts and NPR 405 in Terai districts.

The share of variable costs (such as feed, labor, and other operational expenses) per kilogram of meat was NPR 260 on average. Commercial farms incurred NPR 205, semi-commercial farms NPR 261, and small-scale farms NPR 388. Hilly and Terai districts both showed a similar variable cost share of NPR 260.

The contribution of working assets (such as short-term equipment and other operational tools) averages NPR 77 per kilogram of meat. Commercial farms incurred NPR 74, semi-commercial farms NPR 85, and small-scale farms NPR 57.Hilly districts faced a share of NPR 87, while Terai districts have NPR 73.

The share of fixed assets (such as sheds, equipment, and infrastructure) per kilogram of meat was NPR 80 on average. Commercial farms had NPR 89, semi-commercial farms NPR 87, and small-scale farms NPR 33.In Hilly districts, the share of fixed assets was NPR 102, whereas in Terai districts, it was NPR 72.

3.3.7 Impact of shed improvement on profitability of goat farmers

Table 21 explains a comparative analysis of the average cost of production and income estimation for goat farming under three types of sheds-improved, semi-improved, and traditional. Overall, improved sheds resulted in lower production costs, higher profitability, lower abortion rate and better gross and net margins despite higher initial investments. However, traditional sheds still offered a reasonable benefit-cost ratio, especially when un-depreciated capital was considered.

Farms with improved sheds had the highest average total cost of NPR 2.75 million per farm. Semi-improved sheds incurred an average cost of NPR 888,302.06, while traditional sheds had the lowest at NPR 496,199. Average, semi-improved and traditional farms' investment was 2.4, 3.0 and 5.5 times lower than improved shed, respectively (Table 21).However, BCR of un-depreciated capital conditions, all financial indicators such as cost of production, gross margin, net margin and BCR (depreciated) were significantly better than semi-improved and traditional shed. This, study thus

urgently recommend to keeping goats in scientific sheds in order to reduce goat mortality, extending feed and roughages efficiency and overall growth and productivity.

The cost of keeping a goat was lowest in improved sheds at NPR 5,199 per goat. Semi-improved sheds had a slightly higher cost of NPR 5,452, and traditional sheds were the most expensive at NPR 5,560 per goat.

Table 21: Average cost of production and income estimation for types of goat shed

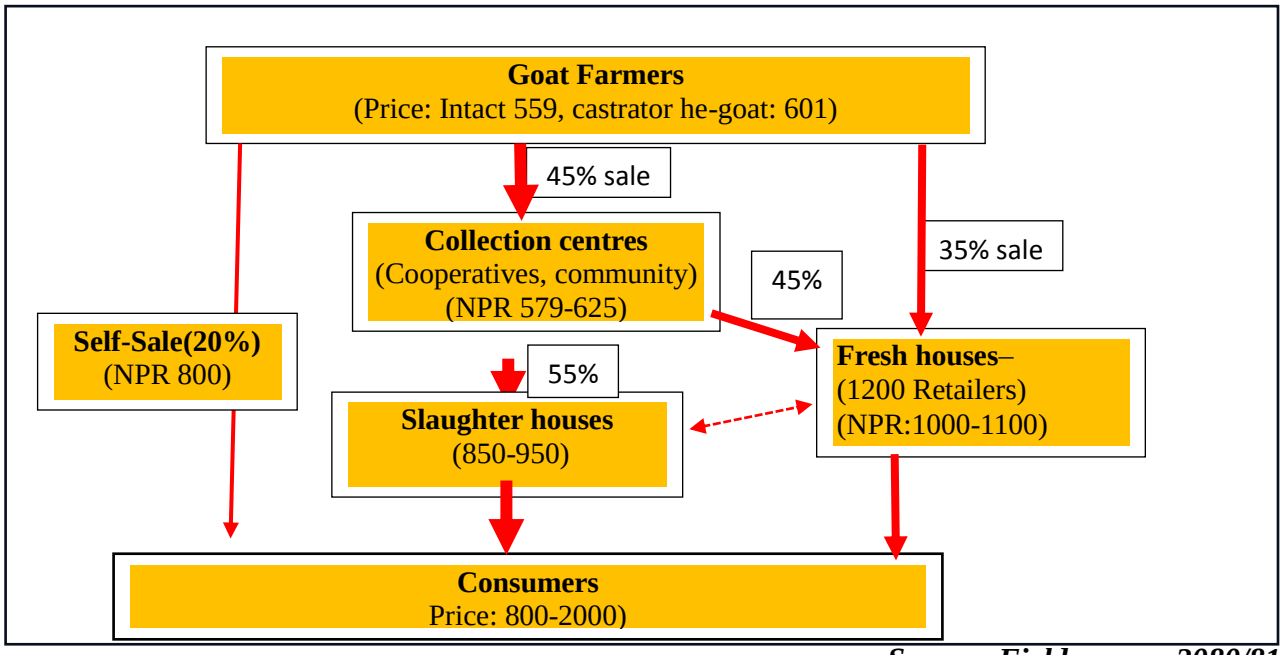
Financial indicators	Improved shed	Semi-improved Shed	Traditional Shed
Average total cost (NPR/farm)	27,46,443	8,88,302	4,96,199
Average cost of keeping goat (NPR/goat)	5199	5452	5560
Cost of production of meat (NPR/kg)	390	422	425
Share of variable cost (NPR/Kg)	195.7	247.1	316.3
Share of working assets (NPR/kg)	75.5	80.1	73.0
Share of fixed assets (NPR/kg)	119.3	94.8	35.5
Gross Margin (NPR/farm)	428610	177432	97547
Net Margin (NPR/farm)	185117	94475	58019
Benefit cost ratio (Depreciated capitals)	2.28	2.21	2.06
Benefit cost ratio (undepreciated capitals)	1.33	1.45	1.65

Source: Household survey, 2080/81

The CoGMP was the lowest in improved sheds at NPR 390.In semi-improved sheds, the cost rose to NPR 422, and traditional sheds incurred the highest cost at NPR 425 per kg. It was because of the lowest share of variable cost (NPR 196/kg) in comparison to semi-improved (NPR 247.0/kg) and traditional sheds (NPR 315/kg). Per farm gross margin estimation for improved shed-focused farming was NPR 428,610, which was significantly higher than semi-improved sheds (NPR 177,432) and traditional shed (NPR 97,547). Likewise, farms with improved sheds had the highest net margin (NPR 185,117) per farm than semi-improved sheds (NPR 94,475) and traditional sheds (NPR 58,019). Finally, Benefit-Cost Ratio, factoring in depreciated capitals, was highest for improved sheds at 2.28, followed by semi-improved sheds at 2.21, and traditional sheds at 2.06.

3.3.8 Assessment of meat marketing in Lumbini province and their effect on farm income

Farmers, typically sold live animals, including intact, castrated he-goat, infertile (culled) doe, and, old doe. Additionally, sales include kids and he-goats intended for future rearing, breeding or religious purposes. Some local cooperatives acted as collection centre role for selling these as meat purposes.



Source: Field survey, 2080/81

Figure 3: Marketing structure of goat meat products in Lumbini Province

Self-sale at home or local Hat Bazar: Farmers directly marketed their 15-20% intact and castrated he-goats through home sales at the nearest Hat Bazars and district market centres in retail form. In hilly districts like Gulmi, Arghakhanchi, Rolpa, Pyuthan, Rukum East, western Palpa, it was common for farmers to slaughter intact, culled or old doe, castrated he-goats locally, sharing the meat price among neighbors, which was a widely practiced local marketing system.

Collection centres: Mostly managed by agricultural cooperatives, the collection centre model was one of the most effective means of facilitating the sale of live intact, infertile doe and castrated he-goats (Photo 1 and Table 23). These centers acted as intermediaries, channeling farmer's goats to slaughter houses (55%), retailers, or butchers (45%), earning an NPR 20 per kilogram as commission. Many collection centers were equipped with holding facilities, allowing goats to be kept for a few days if they remain unsold or to accumulate enough stock for sales to various outlets. Photo 1 shows Collection Centre of Gangajal Krishi Sahakari Sastha, Papara, Arghakhanchi. Some collection centers had direct contract with slaughter houses or wholesale terminal markets such as Khasi Bazaar in Kalanki or Pokhara wholesale market.

Collection centres hadset fourwholesale prices for live goat weight: NPR 420 for ≤ 20 kg, NPR 460 for 25-30 kg, NPR 470 for 30-35 kg and NPR 500 for over 40 kg of intact or castrated he-goats. The Cooperatives or collection centre operators manage the order, hold goats for 3-4 days, and sold them when the time is favorable.

Photo 3: Collection Centre for holding and selling goats in Papara Arghakhanchi

Table 22: Status of cooperatives for selling intact in Lumbini Province

District	Number of Agricultural Cooperatives	Number of he-goats collected	Live weight (kg)	Meat productivity (Kg/intact)	Earning (NPR)	avg. Income /intact	Avg. price/kg meat
Banke	15	4357	134451	30.86	70621719	16209	532
Bardia	13	4522	140719	31.12	71537885	15820	508
Dang	6	2814	88659	31.51	47948594	17039	536
Gulmi	1	33	1322	40.06	601510	18228	455
Kapilvastu	1	238	5111	21.47	2348916	9869	460
Palpa	12	6773	193580	28.58	87341224	12896	451
Pyuthan	3	1439	40305	28.01	19317720	13424	479
Rupandehi	3	1606	41638	25.93	22788831	14190	547
Total	54	21782	645785	29.65	322506399	14806	499

Source; Heifer International, Shrawan 1st 2078 to Asar 32, 2079, B.S (FY 2022)

Table 22 presents a one-year time series of live animal sales by agricultural cooperatives across different districts in Lumbini Province, collected between Shrawan 1, 2078 to Asar 32, 2079 (FY 2022). A total of 54 cooperatives were involved, with a cumulative collection of 21,782 he-goats, yielding 645,785 kg of live weight and generating a total income of NPR 323 million.

Among the districts, Palpa had the highest number of he-goats collected (6,773), producing 193,580 kg of live weight and earning NPR 87.3 million, though it had a relatively low average meat productivity per intact goat at 28.58 kg and an average price of NPR 451 per kg. Banke and Bardia followed closely, collecting 4,357 and 4,522 he-goats, respectively. Banke had a higher income per intact goat at NPR 16,209 compared to Bardia's NPR 15,820, with Banke achieving an average price of NPR 532 per kg of meat versus Bardia's NPR 508. Cooperatives of Dang districts showed the highest average meat productivity per he-goat at 31.51 kg and earned NPR 17,039 per intact goat, with a total income of NPR 47.9 million from 2,814 goats. In contrast, **Gulmi**, with only 33 goats collected, had the highest income per intact goat at NPR 18,228 but the lowest total earnings at NPR 601,510. **Kapilvastu** had the lowest average income per he-goat at NPR 9,869 and collected only 238 goats, leading to a total income of NPR 2.3 million, the lowest among all districts. **Pyuthan** and **Rupandehi** had similar numbers of goats collected (1,439 and 1,606, respectively), but Rupandehi had a higher average price per kg at NPR 547 and a higher income per intact goat at NPR 14,190.

Average price variation among district was between NPR 451 to 547, which was almost similar to cost of production in FY 2080-81. It gave idea that farmers were getting prices as similar to cost of production.

Slaughterhouses: Both formal and informal sale had been taken place through slaughterhouses, that were lying in Terai districts, particularly in areas like Parasi Bazar, Butwal, Lumbini, Ghorahi, Kohalpur, Nepalgunj and Gulariya Bazaar. In recent years, Butwal sub-metropolitan constructed a large-scale slaughterhouse with a daily handling capacity of 400 metric tons of chevon or mutton. It was intended to operate under company model in partnership with Muktinath Krishi Company Ltd, but it is proposed to operation, with the full handover of operations yet to take place. According to the Meat Act, all animals slaughtered in these facilities must have a veterinary certificate. However, butchers reported challenges in meeting these compliance requirements, which has led to many slaughterhouses operating informally.

Retailers or Butchers: Every district in Lumbini province has at least 100 plus retailers operating fresh meat or frozen meat shops for selling red and white meat products such as pork, buff, mutton, goat (chevon), duck, chicken and fish. They sourced animals either from collection centres or directly from farmers. Pricing was typically based on animal types, with oxen in rural districts being sold by the head, while goats purchased from collection centres were priced by weight.

3.3.8 Ranking major factors affecting goat's cost of production

Study collected goat farm specific constraints of raising goat, which were affecting cost of production. Table 22 outlines the ranking of key constraints related to goat meat production, based on farmers' preferences as indicated by the index values. Each constraint is categorized by its level of severity—immediate, acute, important, moderate, and low problems—and was ranked accordingly.

The foremost trouble ranked by farmerswas **"Poor scientific keeping system due to inadequate technical and physical support at farms**" with a score of 2.99. Goat farmers identified this as the top constraint, with 16% considering it an immediate problem, 18 an acute problem, and 11 an important problem.

The study investigated the availability of field-level support from technical experts and organization, as well as the grants and subsidies received. Among the 15 farms with improved sheds, 11 received a subsidy of NPR 1.7 million, covering 16% of theirtotal investment of NPR 10.8 million. Additionally, 19 out of 34 farmers with semi-improved sheds reported receiving a subsidy of NPR 1.3 million (17% of total investment), averaging NPR 72,121 per farm. Fodder and forage seed subsidies covered 50%, but only 11% respondents benefitted from that. Support from VHLSC or project-based programs like NLISP or PMAMP was insufficient for farmers' need. From their annual budget book, we investigated imbalanced planning, budgeting and support across infrastructure (40%), breed improvement and support (20%), feed (20%), health (10%)and marketing (10%). Semi-commercial and small-scale farmer, who often had low net margins, faced issues with improved shed construction, water supply, goat purchasing, feeding, and labor payments.

Over the past five years, farmers reported a38% mortality rate due to diseases, parasites, toxic grasses during grazing and wild animal attack[4]. Unavailability of veterinary experts at field level service was considered as major causes of increasing goat's mortality. Their service or extension service of the government was mainly demand led. Those who brought goats to VHLSKC received breeding, artificial insemination, vaccination, and treatment services at nominal fees. However, services from field visits were minimal because field visits were infrequent, focusing mainly on model farms, with officers often engaged in administrative tasks rather than fieldwork. Many officers lacked the skills needed to provide effective services, as they were promoted from JTA roles with limited training in clinical services and scientific goat management.

The second most important problem was "**poor investment in making goat-keeping scientific sheds"** with index value 2.56. While only 4 farmers identified this as an immediate issue, it was recognized as a moderate problem by 36 farmers. The lack of proper sheds hindered effective goat rearing. Impacts of scientific shed management has also explained under 3.3.7 sub-title and we strongly suggested to support for shed improvement program.

The third most important problem was **"Feeding insufficient varieties of forage and fodders"** with index value 2.56. While only 4 farmers identified this as an immediate issue, it was recognized as a moderate problem by 36 farmers.

Insufficient diversity in fodders and forages negatively impacted goat's health and growth, especially for farmers relied on public grazing areas with limited lush pastures. Access to diverse pastures, including grasses and legumes, was crucial for meeting goat's natural feeding habits (mobile lip). Goats typically follow an S-shaped growth curve, with a rapid growth during early stages (pre- and post-weaning-up to 3/3 months) and slower growth as they approach maturity (Beyond 7 months). Mostly commercial farms with improved management system adhered to recommended feeding practices, and breed-specific forage management was largely ignored[5].

[4]The experience was shared by Mr. Prem Sagar Poudel of Sainamaina Krishi Udhyog, Rupandehi, who has been raising 400 goats for supplying quality kids and meat under a grazing-based goat-keeping system.

[5] Each breed has specific forage requirement. **Boer Goats** require more nutrients dites to support their rapid growth rates. **Jamunapari Goats** benefit from high-quality forages and supplements due to their dual-purpose nature. **Khari Goats** are adaptable to local conditions but still require balanced nutrition, especially during critical physiological stages. The hybrid of any crosses with Khari can cope any local feeding environment but it needed proper management system.

Understanding growth patterns and feeding needs of breeds like Boer, Jamunapari, Khari or their cross was vital. Integrating fodder trees, feeding and supplement use could improve not only goats' productivity but also farmers' profitability.

Unavailability of quality goat breeds (both cross and pure) ranked fourth, with an index value 2.29. Although 30 farmers considered it a low-level problem, 15 identified it as acute issue. During our visits, extension offices and commercial farmers highlighted the lack of quality breeds for fast meat production, fecundity, milk, hide or dual-purpose traits. Goat experts reported that locally available high-quality breeds could reduce cost of production by 20% due to the faster adaptation in grazing-based feeding system, low transportation costs and low external feeding cost. Existing government-run breed stocks (in Kailali and Bandipur) and private breeding centers failed to meet even 50% pure breed of Boar, Jamunapari, Saanen, Beetal, Barbari, Sirohi and other feasible breeds (Photo 2).

Photo 4: Goat farming cum breeding centre, Sainamaina-4 (left) and Boar Goat Breeding Centre, Chhapia, Rupandehi (Right)

This shortage led to higher breed charges (such as NPR 2000 /kg for live weight for Boar) and increased transportation expenses. Artificial Insemination (AI) services for goat were still in the early stages, limiting the growth of desired crossbreeds. Furthermore, breeding experts reported that **inbreeding depression** was a major overlooked issue on farms, leading to a reduction in meat productivity to half of its original potential.

Sudden death and delays in receiving death claims ranked as the fifth problem, with index value 2.04.This was noted as a moderate or low problem by most farmers, but its impact on financial recovery and goat production was still significant, especially for those facing high goat mortality. Those farms who had purchased goat insurance policy, faced losses, reported death claims from the insured companies, reported lengthy process of receiving death/loss claim sum from the insured companies. In our focus group discussion and interviews with insurance companies revealed that moral hazard issue among goat farmers and insurance companies and made it lengthy for its payments.

These rankings highlight the most pressing challenges farmers face in goat meat production, prioritizing infrastructure, feeding, and breed quality.

Table 23: Ranking of cost of goat meat production constraints

S.N	Types of problem	Immediate problem	Acute Problem	Important problem	Moderate problem	Low problem	Index value	Ranking
P.1	Inadequate technical support at goat farms	12	18	11	25	9	2.99	I
P.2	Poor investment for making goat-keeping scientific shed	4	13	13	36	9	2.56	II
P.3	Feeding insufficient varieties of forage and fodders	2	10	18	23	22	2.29	III
P.4	Unavailability of quality (cross, pure) goat breed	3	15	10	17	30	2.25	IV
P.5	Sudden death and delay in getting death claims	1	7	14	25	28	2.04	V

Source: Household survey, 2080/81

3.3.10 Goat meat-specific marketing constraints

Study asked to ranked major problems that were faced by the growers and these are presented in Table 25.

Table 24: Goat-keeping marketing constraints ranking

S.N	Types of problem	Immediate problem	Acute problem	Important problem	Moderate problem	Low problem	Index	Ranking
M.1	Low investment for meat marketing infrastructures	11	28	13	16	7	3.3	I
M.2	High number of doe sale in low price, low sale of castrated he-goat	6	20	26	15	8	3.01	II
M.3	No contract sale arrangement	0	20	18	14	23	2.55	III
M.4	Sale of low value-added products, live animal).	2	6	22	28	17	2.2	IV
M.5	Perceive low quality meat of improved breeds such as Boar and Jamunapari.	0	7	23	21	24	2.17	V

Source: Field survey, 2080/81

Goat marketing system was primitive and slightly making a pace of involvement of cooperatives and private traders. Sales dynamics was changing these days: decreasing trend of selling castrated he-goat and increasing trend of selling he-goats. These animals were sold for using fresh Chevon. Hardly 5% of these intact and castrated he-goats used for industrial or processed products. There was wastage of resources for converting these diversified products such as making diversified meat

items, wool for garment weaving, hide for leather items, and fat and bones for industrial items (cosmetic, bone mills).

Farmers did not face selling problem because there was un-meet demand of intact for making fresh Chevon not only in household level but also demands of organized consumers such as hotels, restaurants, Clubs and schools. As we explained in above, Prices they received at farm get are different for each product. The marketing constraints faced by goat farmers, as ranked by index score, reveal significant challenges in the sector:

Foremost trouble that farmers reported was **"Low investment for meat marketing infrastructures," with an index value of 3.3.** Market infrastructure means physical infrastructures for holding goats, price determination system, regularity in sale, transport management, market intelligence and cold chain development for frozen meat products. A few agricultural cooperatives and traders, with the support of Heifer International and NLISP, were preparing collection centres, semi-formal marketing arrangements and sale records in last five years but inter-districts marketing system was totally informal. The standards explained in Meat Acts were not following. To date, no wholesale markets were functioning across districts of Lumbini province. Because of these problems, small-scale farmers' net margin and benefit cost ratio were unattractive. Absence of contract sale arrangements (Hat Bazar, public slaughterhouses), farmers highlighted the difficulty in accessing formal markets or selling their goats through structured platforms. The absence of public slaughterhouses or contracted sales has forced them to rely on informal and unpredictable market outlets, reducing income stability.

The second foremost trouble that farmers reported was "**Low sale of castrated he-goat**," with an index value of 3.01. Firstly, farmers reported a significant reduction in castrated he-goat sale, increased trend of he-goats and doe (female goat especially infertile and older one), which impacted market profitability by selling castrated he-goats. This shift had created imbalances in supply and demand, especially for castrated goats, which were traditionally favored. Retailers (butchers) mostly bought old or infertile doe in low price (NPR 250-300/kilogram) and sold these for meat propose as equal to meat price for castrated he-goats or intact (Rs.1000-1100). They ultimately earned surplus margin with doe purchase over castrated he-goat. There was no regular meat quality checking mechanism at the slaughterhouses and fresh houses and large benefits went for them. Benefits one year data analysis for district showed that there was ample scope to increase productivity of meat animals and price accordingly.

No Minimum Support Price (MSP) for goat meat and absence of breed-wise market information ranked third with an index score of 2.55. Farmers noted the lack of established systems to set goat meat prices based on breed, quality, or location. Additionally, goat associations were found to be inactive in advocating for better pricing mechanisms or facilitating market information dissemination.

Low value-added product sales ranked fourth with an index value of 2.2. Farmers mostly sold live animals instead of processed meat or value-added products, missing opportunities to increase their income by tapping into higher-value markets for goat meat, hides, or other by-products.

Perceived low quality of meat from improved breeds and challenges in selling Boer and Jamunapari breeds ranked fifth, with an index value of 2.17. Some buyers perceived the meat quality of these improved breeds as inferior, making it difficult for farmers to market these goats, particularly Boer and Jamunapari, which are known for their dual-purpose qualities (meat and milk).

These constraints indicate the need for better market infrastructure, pricing support, and awareness to boost the profitability of goat farming.

PART 3: COST AND BENEFIT ANALYSIS FOR FISHERY

3.4 Fishery statistics at national level and Lumbini Province

The fishery sub-sector contributes ~0.53% to the total gross domestic product (GDP) and 1.82% to the agricultural GDPin the country. The commercially important fish species in Nepal are carps, rohu, mrigal, Bhakur, Pangas, Mangur, African Mangur, Nile Tilapia, and rainbow trout. Currently, 1.02% of Nepali households, including 6,793 registered enterprises, are involved in the fishery value chain (ISO, 2024). Aquaculture practices expand over 55 districts (out of 77) in Nepal with >85% production concentrated in the Terai region (Jha, 2020). During the past 13 years, freshwater fish farming grew at the rate of 8.9% annually, reaching 87,385 metric tons in 2021/22 and covering ~18,200 hectares of water surface (MoALD, 2023). Fishery sub-sector has often been touted as a feasible option for farm income generation, gender empowerment, poverty alleviation, nutrition security (especially protein supply), and creating a linkage among rural, peri-urban, and urban areas. About 88% (i.e.,108,385 Mt.) of total national fish demand is met domestically, with an additional 12% imported, mostly from India(TEPC, 2023).

Fish farming is growing in Lumbini province too. Water area for pond-fish production is 2982 ha and production in fiscal year 2078/79 is estimated 13,438 metric ton, with the productivity of 3.45 Mt per hectare(Table 25). Top-five fish producers in the province are Rupandehi, Kapilvastu, Banke, Bardia, and Nawalparashi West, with the share of 46%, 17.3%, 13%, 8.4% and 8% respectively.Average productivity (yield per hectare) is reported 3.45 t/ha, with the range of 1.89 in Rolpa to 5.19 t/ha in Rupandehi.

Table 25: Pond-fish area, production and productivity in Lumbini Province in FY 078/79

District status	Water area (ha)	Production (Mt)	Productivity (Mt/Ha)
Nawalparashi West	226.13	1086.18	4.8
Rupandehi	1187.33	6164.802	5.19
Kapilvastu	552.8	2320.598	4.2
Banke	277.4	1122.28	4.04
Bardia	428.28	1707.616	3.9
Palpa	16.99	48.401	2.8
Dang	258.67	906.732	3.51
Gulmi	11.55	31.185	2.7
Arghakhanchi	6.74	17.79	2.64
Pyuthan	10.82	23.15	2.14
Rolpa	4.76	9.04	1.89
Total	2982	13438	
Average			3.45
Median			3.51

Source: Annual Progress Report, Ministry of Agriculture and Land Management, 2023

Table 26 shows that out of 765090 holdings in Lumbini province, 7596 holdings (0.83%) reported fish farming in their average land share (0.31%). By pond numbers, Rupandehi, Nawalparasi West, Kapilvastu, Bardia and Dang are top five fish producers.

Table 26: Number of holdings involved in fish farming and number of ponds

District name	# of Holdings	Area (ha)	# of holding reporting fish farming in pond	# of ponds	Pond area (ha)	% share in holding for fish farming	%share in land
Rukum East	11845	4762.4	32	32	0.4	0.27	0.01
Rolpa	46842	23641	30	30	2.3	0.06	0.01
Pyuthan	50717	22076.1	96	96	5.2	0.19	0.02
Gulmi	55911	33855.2	217	231	8.5	0.39	0.03
Arghakhanchi	42418	25168.2	43	43	0.3	0.10	0.00
Palpa	49742	28952.8	413	413	14.4	0.83	0.05
Nawalparasi West	55098	30123.8	1520	2085	314.5	2.76	1.04
Rupandehi	117333	65555	2641	3305	701.7	2.25	1.07
Kapilvastu	84675	61217	1170	1234	217.1	1.38	0.35
Dang	101880	49278.1	401	603	307.2	0.39	0.62
Banke	67885	36828.3	321	332	28	0.47	0.08
Bardia	80744	45157.1	712	821	172	0.88	0.38
Total	765090	426615	7596	9225	1771.6		
Average						0.83	0.31

Source: NSO, (2024)

3.*5* Analyzing Cost of Production of Fish Growers

3.5.1 Socio-economic determinants affecting cost of production

Age, experience, and ethnicity: The average age of fish growers was 46.8 years, ranging from 27 to 77 years. Within this age group, the average fish farming experience was 12.49 years, ranging from 2 to 41 years. This experience included fishing in local rivers, farming carp in their ponds, and selling to reliable traders. Among the 73 samples analyzed, 35% were Adibashi, mostly Tharu and Chaudhary, 23% belonged to mixed castes, including Madhesi, Terai Dalit, and Janajati, while the rest were Kshetri and Brahmin.

Education level: The average education level was eight years. Only 16% of respondents had education above the +2 level, while 27% had no formal education or had completed adult literacy and primary education. None of the respondents or their families had specific education in fish farming. However, 15% reported having received short-term training in fish keeping, supported by the former AKC or veterinary hospital.

Types of organization: By organization, the majority was organized into firms, mostly small and cottage industries, while one-third had registered with cooperatives and fish farming groups. Some larger companies were registered with the Company Registrar's Office. Polyculture carp farming dominated the overall farming practices.

Pond-types and fish farming land size: Among the different types of ponds, respondents only had nursery ponds and production ponds for keeping fish. Over the past eleven years, approximately 71% of farms had excavated nursery ponds with an average size of 1.4 Kaththa (0.047 ha) to rear hatchlings and fry until they developed into fingerlings or advanced in size over a period of 2 to 6 months.

Almost all farms had production ponds, with a total of 151 ponds and an average of two ponds per farm, used for rearing fish for sale. The average gross area of the production ponds was 24.4 *Kaththa* (0.81 ha), with a total of 59.42 hectares (1,517 K*aththa*) devoted to fish farming. Of this, 85% (approximately 51 ha) was net water area. The average duration of pond use for production was 11 years.

Among these farms, 56 converted rice-wheat farming land into fish ponds, 13 converted fallow land, and the rest converted minimal areas such as swamps or former brick factory sites. Based on the farmers' self-valuation, the opportunity cost of the land used for ponds amounted to NPR 2.45 billion, with an average valuation of NPR 34.08 million per farm."

Study categorized three-type farming[6]: commercial, semi-commercial and small-scale or sub-commercial (Table 21). Among commercial 21% farms, average land size was 1.92 ha, ranging from 1 to 5.67 ha. Average size for semi-commercial and small-scale farming had 0.63 ha and 0.18 ha respectively. Additionally, 335.4 *Kaththa* land was rented in and 328 *Kaththa* (avg 11.31) was rented-out.

Table 27: Water area of production ponds in the study area

Farming type	Land size (Hectare	Sample size	Average land size (Ha)	Total land (ha)	Min (Ha)	Max (Ha)
Commercial	≥ 1.0	15	1.92	29.73	1	5.67
Semi-commercial	0.34 to 1.0	25	0.63	15.92	0.36	0.93
Small-scale/ Sub-commercial	≤ 0.33	33	0.18	5.92	0.067	0.33
Total		73	0.69	51.57	0.067	5.67

Source: Household survey, FY 2080/81

3.5.2 Fixed asset investment situation of fish-keeping farmers and its share in total cost

Table 28 illustrates 11 types of fixed assets used for fish growing, with a total investment of NPR 69.16 million and an average investment of NPR 1.73 million. The per-hectare investment was NPR 1.74 million. The study estimated that the largest investment was for pond digging/excavation, with an average cost of NPR 654,595 for an average pond size of 0.69 ha. Farmers reported low investment in the past years and now fixed cost surged, which is why the cost ranged from NPR 32,500 to NPR 3.3 million. The share of pond excavation in fixed costs was 69%, and it accounted for 42% of the overall cost of production.

[6]Three categories are based on support strategy of PMAMP super zone. Farming upto 0.33 or 10 kaththa was said sub-commercial, 10-30 kaththa is called as semi-commercial and while more than 1 ha is called as pure commercial.

Table 28: Types of fixed assets, investment and share in total cost of fish-keeping farmers

Fixed cost items	Total investment	Mean investment	Median	Min	Max	Depre-ciation	Share in fixed cost (%)	Share in total cost (%)
Pond excavation	47785470	654595	380000	32500	3250000	19423	69.1	42.11
Irrigation items (Deep, swallow, pipes, tank, pump)	8838000	133909	99250	12000	976000	10967	12.8	7.79
Farm boundary	905000	452500	452500	200000	705000	36385	1.3	0.80
Store room/house	280000	93333	50000	30000	200000	915	0.4	0.25
Local Tools and Utensils	489900	6999	5000	1400	35000	805	0.7	0.43
Pond Aerator	2223000	74100	55000	10000	840000	8528	3.2	1.96
E-machines (Freeze, grinder, mixture etc.)	2550850	35428	25000	2800	251500	4088	3.7	2.25
Fishing net (Gill net, hand nets, baits including)	775000	12917	10000	0	115000	1487	1.2	0.68
Salary of permanent staff	2748000	274800	288000	120000	400000		4.0	2.42
Office assets	331500	30136	12500	1000	180000	3468	0.5	0.29
Other assets (road, trails, vehicle etc.)	2147400	107370	27000	1500	546000	7793	3.1	1.89
Total	69156120	947344	650500	54600	4734000	80112	100	60.88
Fixed cost (Hectare basis)	126878190	1738057	1406475	559500	5077500			

Source: Field survey, 2080/81

3.5.3 Estimation of recurrent costs of fish production

Table 29 illustrates seven major types of variable costs (VC) that included fish seed, feed, labor, and other operational inputs. The total variable costs amounted to NPR 44.62 million, representing 39.22% of the total cost of production. Average amount that farmers invested was NPR 611231, in a range of NPR 70,025 to 30,66,200. Among VC item, share of feed and labor, this together accounted nearly 80% of the total variable expenses.

Table 29: Types of variable costs and expenses for fish farming

Types of variable cost	Total expense	Average expense	Median expense	Minimum investment	Maximum investment	Share in variable cost (%)	Share in total cost (%)
Fish seed	1718315	23539	9900	1500	216000	3.85	1.51
Feed, supplement and natural feed management	23628633	323680	243300	28025	1271000	52.96	20.77
Labour (family, skilled and unskilled)	11755025	161028	134400	21900	960000	26.34	10.33
Liming, treatment, loss, loan) risk management	1436848	19683	7480	500	74200	3.22	1.26
Repair and maintenance	2025385	27745	18000	1000	237000	4.54	1.78
Electricity cost	955300	13086	9000	1200	48000	2.14	0.84
Others (transport, communication, fuel, integration)	3100357	42471	39500	15900	260000	6.95	2.72
Total	44619863	611231	461580	70025	3066200	100	39.22

Source: Field survey, 2080/81

3.5.3.1 Expenses in fish seed

Share of fish seed in variable cost was 4% but it was ≈2% for overall cost. Average investment amount was NPR 23539.0 in a range of NPR 1500 to 216000. Further analysis took place for species-focused. Table 30 illustrates eight types of fish species were used in farming fish.

Table 30: Types of fish seed used, expenditure and mortality rate

Fish types	Fish seed Quantity	Average purchase after mortality	Total expenditure	Average expenditure	Share in total cost	Mortality (%)	Fish seed types
Common carp	183946	2036	344581	4720	20.05	18.00	H,F,Frl,Adv-Frl
Grass carp	116385	1481	223535	3062	13.01	15.00	H,F,Frl,Adv-Frl
Bighead carp	89955	1097	238798	3271	13.90	12.53	H,F,Frl,Adv-Frl
Silver carp	129555	1430	323986	5491	18.85	7.77	H,F,Frl,Adv-Frl
Rohu	119035	1327	256421	4274	14.92	15.52	H,F,Frl,Adv-Frl
mrigal /Naini	113388	1285	276745	3791	16.11	11.82	H,F,Frl,Adv-Frl
Catla /Vakur	15050	1945	50750	7250	2.95	13.14	H,F,Frl
Pangas	500		3500*	3500	0.20	10.0	Frl
Total	767814	10601	1718315	35360	100		

Source: Field survey, 2080/81

Note: H= Hatchling, F= Fry, Frl= Fingerlings, Adv-Frl= Advance Fingerlings

Among these species in Table 30, the first four were exotic, the next three were indigenous carps, and the last one was a catfish species. We included only one sample of pangas; otherwise, all farms were generally focused on carp species. Approximately 0.8 million fish seeds were used, with an average of 10,601 pieces per farm and 16,457 pieces per hectare. This quantity was about 10% higher than the technical recommendation of 12,000 to 15,000 pieces per hectare after accounting for mortality.

In terms of investment, the top five fish species were common carp (20%), silver carp (19%), mrigal (16%), rohu (15%), and bighead carp (14%). Farmers used four types of fish seeds: hatchlings, fry,

fingerlings, and advanced fingerlings. The mortality rates for these stages were 65%, 25%, 10%, and 8%, respectively. Among the farms, 85% used fry and fingerlings, while the rest used hatchlings and advanced fingerlings.

3.5.3.2 Expenses in fish feed, supplement and natural food production

Investment in feed, supplements, and natural food production was the major expenditure item for fish growers. The share of this item within variable costs was 53%, and it accounted for 21% of the overall cost. Table 31 shows that farmers used two types of feed, totaling 541 metric tons: 86.5% homemade and 13.5% factory-made. As a result, the major expenditure was on homemade feed (69%), with 17% spent on factory-made feed. For homemade feed, farmers used mustard cake, rice bran, and occasionally wheat flour. For factory feed, they used both sinking and floating types, with 97% sourced from Nepali factories and 3% from Indian manufacturers. In addition to these feeds, farmers invested NPR 1.23 million, or an average of NPR 64,497, in feed supplements such as probiotics, enzymes, vitamins, minerals, and micronutrients**.**

Likewise, farmers had used estimated NPR 2.2 million amount or average NPR 30245 for developing live food/feed such as algae, duckweed, hydrilla, planktons naturally by applying farm yard manure, fertilizer (DAP, MoP) and Ajola. Likewise, they also cultivate forage (berseem, Stilo) or fodder grasses such as Napier, banana) at dikes of ponds or separate land for feeding herbivorous freshwater grass carp.

Table 31: Estimation of expenditure on feed, supplement and natural feed management

Type of feeds and live feed	Total quantity (Mt)	Average Qnt (Kg)	Total expenditure (NPR)	Avg. Expenditure (NPR)	Share in variable cost (%)	Remarks
Home-made feed	467.3	222.2	16219663	222187	68.64	Mustard cake, bran, wheat flour, etc
Factory made feed (domestic and india)	73.2	2.7	3972400	128142	16.81	Choker, sinking and floating feed
Feed supplement			1228650	64497	5.20	Probiotics, micronutrients/enzymes, vitamins& minerals
Natural food (Phyto/zoo plankton) production			2207920	30245	9.34	Fodder sets, forage seed, FYM, Fertilizer, associated costs
Total			23628633	445071	100.00	

Source: Field survey, 2080/81

3.5.3.3 Expenses in labour

Labour cost included unskilled (family labour and daily wage) and skilled labour, which covered 26.3% in total variable cost and 10.3% total cost. Fish farming employed family members about 6 hours /day and with a calculated wage NPR 83.4/hour. Within labour works, family labour, casual labour and skilled labour contributed (99.6%) and other contributed 0.4% share.

3.5.4 Yield, income and % share of various types of fish species

Table 32 illustrates yield in terms of live and fresh harvested quantity, respective prices received by the farmers, income and share of each species on total fish income and income of integrated activities. As it is seen in table, it was estimated that the farmers received NPR 89.59 million (avg.

1.5 million) by selling 352 Mt fish, with average of 8.39 Mt. Further, we estimated per hectare productivity 7.7 Mt and income NPR 17.72 million. Farmers produced common carp as top most fish species for production (109 Mt) and income (NPR 29.9 million). Share of that species was 33% in total fish income and 32% for integrated income. Likewise, second, third, fourth and fifth position in production, income were grass carp, silver carp, Rohu and Naini species.

Table 32: Live and fresh sale, yield and income of fish species

Variables	Common carp	Grass carp	Bighead carp	Siver carp	Rohu	Naini	Vakur/ Catla	Pangas	Total
Sum live sale (Mt)	108	52.9	40.8	54.5	44.0	44.4	3.7	0.75	349.1
Avg live sales (kg)	1500	853	785	940	746	694	613	750	6131
Avg. price for live sale (NPR/Kg)	280	270	225	249	256	265	325	250	
Fresh sell (Kg)	900	110	0	700	300	340	1340		3690
Avg. fresh sale (kg)	180	55	0	233	75		670		1213
Avg. price (Rs/kg) for fresh sell	292	300	0	249	243	250	9908		
Total production (Mt)	108.9	53	40.8	55.2	44.3	44.73	5.02		351.95
Average production (Mt)	1.5	0.83	0.85	0.94	1.01	0.60	0.72		8.39 (7.7)
Total income (Mil)	29.9	13.51	8.9	13.13	11.5	10.87	1.68	0.12	89.59
Avg. income (NPR)	409157	204681	129046	218873	182088	164708	240500		1549053
Share in fish income (%)	33.34	15.08	9.94	14.66	12.88	12.13	1.88	0.17	100
Share in integrated income (%)	31.87	14.41	9.50	14.01	12.24	11.60	1.80	0.16	95.58

Source: Field survey, 2080/81

3.5.5 Estimation of cost of fish production

Table 33 presents the "Cost of Fish Production (CoFP)" in NPR per kilogram and the proportion of different cost components, as discussed in earlier sections. The study estimated an average CoFP of NPR 167 per kilogram, with a median of NPR 161.4 per kilogram. Fixed costs accounted for NPR 17.1 (10.3%), while variable costs totaled NPR 150 (89.7%) for integrated farms that generated additional income from micro-activities such as dairy, vegetables, ducks, pigs, poultry, pulses, and grain cultivation around the pond area. The net variable costs were calculated after subtracting the annual income from these additional activities. Since the costs of integrating these activities were included, it was essential to account for the income generated to accurately assess the CoP.

Among the cost components, feed and live feed represented 52% (NPR 78.3) of the variable cost of fish production (VCoFP), followed by labor, which accounted for 27% (NPR 41), and other costs, contributing 10% (NPR 15). The electricity tariff added NPR 2.8/kg or 1.9% of the total variable costs.

If excluded income from integrated activities, the CoP would increase by approximately 12%. In this scenario, the average CoP would rise to NPR 187, with a median of NPR 181. Under these conditions, variable costs would constitute about 91% of the total, with the remainder coming from fixed costs. For the fixed cost estimation, the study used the depreciated value of assets over five

years, assuming they would be used for more than five years. The total costs (including depreciated fixed costs and variable costs) were divided by the corresponding fish yield, which was produced using the poly-culture method.

Table 33: CoFP and share of various items

Share of fixed and variable cost items	Cost of production considering no other income	Cost of production considering income of other integrated activities	Share of various variables (%)
Mean, cost of production (NPR)	187.1	167.0	
Median, cost of production (NPR)	180.7	161.4	
Average fixed cost (depreciated) (NPR)	17.1	17.1	10.3
Avg, variable cost (NPR)	169.9	149.9	89.7
Share in total variable cost			
Avg, fish seed expenses (NPR)	4.2	3.7	2.5
Avg, home-made feed materials (NPR)	54.1	47.7	31.8
Avg, factory feed (sink, floating) (NPR)	19.8	17.4	11.6
Avg. feed supplements (vitamins, minerals, etc.)(NPR)	5.0	4.4	3.0
Avg. FYM, fertilizer etc for live food production (NPR)	10.0	8.8	5.9
Avg. Labour cost (NPR)	46.1	40.6	27.1
Avg. treatment, loss, risk management (NPR)	5.2	4.6	3.1
Avg. repair and maintenance (NPR)	5.1	4.5	3.0
Avg. electricity expenses (NPR)	3.2	2.8	1.9
Avg. other costs (NPR)	17.0	15.0	10.0

Source: Field survey, 2080/81

Table 34 illustrates varied level of CoP and productivity for three farms: commercial, semi-commercial, and small-scale. Although average productivity of small-scale farms was 8.87 Mt/ha, their cost of production was nearly 15% (NPR 192) higher as compared to average farms, because of higher (16%) variable cost. Unlike it, CoP of commercial farm was 25%, 26% and 34% lesser that average farms, semi-commercial and sub-commercial farms, respectively.

Table 34: Cost of production and productivity for types of commercialization

Types of farms	Productivity Kg/ha	CoP (NPR/kg)	Fixed cost (NPR/kg)	Variable cost (NPR/Kg)
Commercial farm (>1 ha) (n=15 farms)	6298	126.08	19.81	106.28
Semi-Commercial farm (0.3 – 1.0 ha) (n= 25 farms)	7198	158.95	10.79	148.18
Sub-commercial<0.3 ha) (n= 33 farms)	8871	191.76	16.4	174.5
Cumulative (n=73 farms)	7769	167.0	17.1	149.9

Source: Field survey, 2081/81

3.5.6 Benefit cost ratio analysis for fishery farms

To estimate the benefit-cost ratio (BCR) of fishery farms, the study used the costs and income from the last five years (2076/77–2080/81). Table 35 shows that the BCR ranged from 0.94:1 to 4.29:1, with an average BCR of 2.12:1 when considering the income from integrated farming. The BCR values for commercial, semi-commercial, and small-scale farms were 2.77, 2.01, and 1.9, respectively. Similarly, Table 35 illustrates the BCR for sole fish income, excluding the income from integrated farms. In this context, the BCR values for commercial, semi-commercial, and small-scale farms were 1.93, 1.45, and 1.47, respectively. In all cases, the investment in fishery enterprises was profitable, with the BCR being significantly higher when integrated income was considered. Notably, commercial farms showed the highest BCR.

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Table 35: Benefit cost ratio of fishery farms

S.N	Types of farms	With net fish income	With other income of integrated farms
1	Commercial farm (>1 ha) (n=15)	1.93	2.77
2	Semi-commercial farms (0.3-1 ha) (n=25)	1.45	2.01
3	Sub-commercial/Small-scale (<0.3 ha) (n= 33)	1.47	1.91
	All farms (n=73)	1.56	2.12

Source: Own estimation from Household Survey 2080/81

3.5.7 Production and marketing challenges of rising cost of production and uneven BCR

3.5.7.1 Ranking production constraints that are rising CoP and BCR

Table 37 illustrates ranking top five problems faced by the fish-raising farmers. Among many troubles are facing, "Sudden death due to fish diseases, and parasites, low on-field technical support for it"was ranking as topmost problem with index value 3.69. Also, from FGD and KII, same problems reported differently.

- Farmers reported no right expert in the Lumbini province dedicated to fishery disease and parasite management. In recent five years, farmers reported losses upto 50% because of diseases, parasites and both;
- Whatever are fishery experts, they were engaging in administrative and paper work related to handling grant, sub-sidies, or incentives. Field work and field jobs are considered as drudgery in the office time. Available officer had low capacity to provide needy services due to low education as they were upgraded from JTA to officer level, who were low skilled in clinical services, water checking and other managerial services need for fish farming;
- Despite of many fish clinic camps or on-pond periodic visits made in the fish farms, technical staff or offices are often charged low monitoring of their field. Discussion revealed at VHLSKC that they accepted farmer's sayings. Available offices had rarely fulfilled fishery officer position. In frank speaking, Department of Livestock Services (at federal level) and Directorate of Livestock Management and Fishery Development (at province) consider fishery as small unit and would like to remain same because of their high priority to livestock production.

Table 36: Production constraints ranking for fish farming

Likert scale: 5 to 1 as urgent to low scale problem

S.N	Production Problems	Urgent problem (5)	Acute problem (4)	Important problem (3)	Moderate problem (2)	Low Problem (1)	Index Value (N=75)	Ranking
P.1	Sudden death due to fish diseases, and parasites, low technical support for it	17	25	27	5	1	3.69	I
P.2	Low investment capacity and no balanced support or incentives in capital assets	9	13	24	24	5	2.96	II
P.3	Water leakage and dryness, low water in summer season Water turbidity, color	4	15	27	25	4	2.87	III
P.4	Costly feed and low feed conservation ratio	17	3	15	30	10	2.83	IV
P.5	Land issue: rent, leasing process, terminate contract	5	11	19	38	2	2.72	V

Source: Field Survey, 2080/81

With score 2.96, "Low investment capacity and no balanced support or incentives in capital assets" was considered the second most important constraints for increasing CoFP. It has three reasons that cost associated. Firstly, per hectare fish farming enterprises needed at least 2.4 million funds to manage their capital assets and variable costs. Relatively farming above than 0.3 ha land was low cost because of economics of scale. Secondly subsidy encourages commercial farming. However, PMMP's and Directorate's 50% matching fund subsidies ceiling were 0.3 to 0.5 million for new pond construction, which were 4.5 to 8 times below than actual expenses of the farmers. Government's planning, budgeting and support policies were lacking balanced in five pillars such as infrastructure, fish seed, feed management, fish health, and marketing.

Ranked score 2.87, "water quality, leakage and low water availability" was the third most factor to increase CoFP. Firstly, household survey estimated roughly 15% contribution in CoFP for water management. Farmers' water pumping cost was rising sharply as farmers were facing downing water table in summer season. Farmers who got 50% subsidy in electricity tariff before 2075 (BS) via installed Krishi Meter were de-installed as the government kept fishery as industrial product. Second, farmers, in rainy season faced flooding and water self-flow problem (due to low water table), which had flowed live food, nutrients and fish from pond, which made substantial loss and sore CoFP. Third, farmers in Sunuwal (Nawalparasi), Chhapia (Rupandehi), Buddhi (Kapilvastu), Badaiyatal (Bardia) reported "heat stress loss" due to long drought, undisclosed load shedding, and dryness of many ponds, water circulation problems.


Photo 5: Water testing technical team (Left) and fish loss (right)

Ranked with a score of 2.83, the "availability of costly feed" was the 4th most significant problem of fish growers, especially in high-density and pangas farming, which were feed-dependent. Farmers faced two key issues:

1. Expensive feed, with income-to-feed cost ratios as high as 3.9:1. Survey results showed feed, supplements, and fodder accounted for 53% of total variable costs and 21% of overall costs (Table 31). FGD participants reported that feed prices had risen by up to 20% annually, while fish prices remained stagnant over the last five years.

2. **Low feed conversion ratios (FCR) from domestic feeds**: While some domestic companies were developing high-quality feeds to replace imports, they were perceived to have a lower FCR than Indian feeds. The standard FCR is 2:1 for factory-feed-based farming and study found average FCR was 1.82:1, with a range of 1.13 to 5.16 kg of feed per kilogram of fish. Issue was raised by the farmers who had perceived low fish growth. Use of imported floating and sinking feeds, mainly from India had higher FCR for fast-growing species like pangas, Nile Tilapia, and Chhadi.

The fifth issue, "Land problems: rent, leasing processes, contract termination," scored 2.83 and ranked as the fourth most significant factor contributing to the rising cost of fish production (CoFP). First, during our FGD, lessee farmers noted that land prices for fish farming had soared over the past decade, ranging from NPR 0.8 to 1.2 million per hectare. Second, landowners were hesitant to lease land for pond construction, as they preferred keeping the land available for alternative uses. Third, entrepreneurs requested long-term contracts, but landowners sought more flexible opportunities for land income. Some landlords prematurely terminated leasing contracts. Fourth, rent taxes (additional 10% of contracted amount) imposed by local governments further increased the cost of fish production. Fifth, while there were many unused public areas, such as rivers, lakes, and swamps, the legal framework for leasing these areas was unclear.

The sixth issue, "Fish seed mortality, unavailability of the right species, and costly seed," was reported by all farmers struggling to obtain fingerlings and advanced fingerlings of available species. Our FGD and KII revealed that commercial farmers were demanding Nile Tilapia, Pangas, and Carp species. Most hatcheries and nurseries had carp fry and used traditional breeding techniques, lacking delivery services. They also faced issues with broodstock quality and breeding depression for high-demand species like grass carp, tilapia, and pangas. Additionally, farmers near border areas imported fingerlings informally from Indian hatcheries, leading to higher transportation costs, increased mortality, and increased transaction cost of managing fingerlings.

3.5.7.2 Fish marketing constraints

Table 37 highlights major marketing constraints ranked by the farmers.

Table 37: Indexing fish marketing problems associated to CoFP and BCR

Market Problems	Urgent problem (5)	Acute problem (4)	Important problem (3)	Moderate problem (2)	Low Problem (1)	Index Value (N=75)	Ranking
High competition	27	9	23	15	1	3.61	I
Low investment in fishery market development	25	12	18	15	0	3.43	II
Low farm-get price	20	20	9	20	6	3.37	III
High marketing cost	5	12	27	24	7	2.79	IV
Low value addition: sale of live and fresh raw items	1	14	27	22	11	2.63	V

Source: Household survey, 2080/81

Ranked with an index score of 3.61, "high competition" was identified as the top challenge for fish farmers. Intense competition was reported by almost all farmers regarding the seasonality, size, and pricing of their products. First, the illegal import of fresh and live fish was uncontrolled and long-routed trouble across the porous borders of Nawalparasi West, Rupandehi, Kapilvastu, Banke and Bardia districts was a major factor. Although Indian large-sized fish were priced higher, off-size fish, often imported illegally, were 15-25% cheaper than Nepali fish types. Second, farmers struggled to sell homogenous, small-sized fish because of slow growth fish species (Rohu, Mrigal) they were choosing.

The second most critical issue, with an index score of 3.43, had been the "low investment in fishery market development". Irrespective of many regular or project-based program implemented, these never focused on scientific wet market development for fish sell. There was limited investment of private as well as government sector to institutionalize wholesale markets like Kalimati and Balkhu, and no wet market development strategies had been implemented in either fish production or consumption hubs. Additionally, refrigerated infrastructure was inadequate, which further restricted the growth and efficiency of fish marketing, making it difficult for farmers and traders to maintain an effective supply chain. That supply chain infrastructures were hardly institutionalized for contract marketing, marketing risk management, sale database preparation and making it difficult for producers to secure stable prices and sell their products efficiently.

The most pressing problem that farmers ranked in 3rd position was "Low Farm-Gate Price" with an index score: 3.37. Fish producer's share on retailers' price was ≈60% and pond-get prices were 43% lesser than retailer's get.

High marketing costs accounted as 4th rank of the farmers, with index score 2.79. Local harvesters cum wholesalers or locally called Mallah took NPR 20-30 per kilogram charges for their sell, which small and commercial farmers felt high cost. These market intermediaries were mostly acting as service providers in price determination according to fish size, harvesting decision and selling fish in their network. Farmers have to wait long time for their fish harvest for the same pond-get price. It show times disturbed their production-sale cycle and loss of their fish during harvesting period.

Sale of fish with low value addition was ranked as 5th problem, wit index score 2.63. Not only in farmer's get, large traders (local wholesalers, cooperatives and wholesalers of terminal market) were involved in selling live and fresh raw items. Selling blast frozen fish had been practiced by Jaldevi Cooperatives, Chhapia (Rupandehi) but efforts were unsatisfactory. There was ample opportunity of selling dried, frozen and diversified fish but ladder of local processing was mostly missing in the Lumbini Province.

4. CONCLUSION AND POLICY RECOMMENDATIONS

4.1 Conclusion

We finalized cost of production for dairy milk, goat meat, and fish in the study districts based on analysis of household survey, focus group discussions, and key informant interviews. Since each component is independent, study has made separate conclusion for each component.

4.1.1 Conclusion related to cost of dairy milk production

Cost of dairy milk production in Lumbini Province Nepal, reveals significant insights into the region's dairy sub-sector. The use of improved and crossbreeds has increased, along with a growing number of registered private firms and companies. Buffalo milk production leads in terms of both volume and per-animal productivity.

The estimated cost of producing one liter of whole milk is NPR 60.93, with considerable variation depending on different socioeconomic contexts. Fixed costs, including shed construction, vehicle, feeding setup, and staff wages, contribute NPR 4.80 per liter. Working capital expenses, such as animal purchasing and fodder management, account for NPR 30.34, while variable costs like feed, labor, and roughages add NPR 24.24 per extra liter of milk. The contribution of these costs varies based on farm size, geography, education, and herd size of the dairy farmer.

The Benefit-Cost Ratio (BCR) of 1.89:1, along with strong gross and net margins, indicates overall profitability. However, these financial indicators are less favorable for small-scale farms. Farmers ranked the top production constraint as expensive milking animals, while the leading marketing issue was delayed payment. These challenges contribute to the rising cost of milk production and lower income from existing markets. Addressing these key issues could improve profitability and sustainability for dairy farmers in the region.

4.1.2 Conclusion related to cost of goat meat production

The goat sub-sector in Lumbini Province remains dominated by local goat breeds, although crossbreeding with improved breeds such as Boer and Jamunapari is on the rise. The estimated cost of goat meat production is NPR 417 per kilogram, varying from NPR 369 for commercial farms to NPR 477 for small-scale operations. The breakdown of costs includes NPR 260 for variable costs, NPR 80 for fixed costs and NPR 77 for working capital. These costs vary based on farm size and geographical location. The study indicates that semi-improved sheds dominate goat farming, with economic indicators showing positive results for farms using improved shed systems. The benefit-cost ratio (BCR) of 2.17:1 suggests that for every rupee invested, farmers are earning an additional NPR 1.17 in profit. This ratio, along with the gross and net margins, proves that goat farming is financially viable across all farm sizes.

The primary constraint to production is the 'poor scientific keeping system,' attributed to inadequate technical and physical support at farms. On the marketing side, the main challenge is insufficient investment in meat marketing infrastructure. The study also highlights the shift in market dynamics from the sale of castrated he-goats to he-goats, with cooperative-run collection centers gaining prominence in the supply chain. The lack of parallel support in production and marketing has increased the cost of goat meat production, leading to lower incomes from existing markets. These

challenges emphasize the need for improved market infrastructure, pricing mechanisms, and farmer awareness to enhance the profitability of goat farming."

4.1.3 Conclusion related to cost of fish production

Fish farming has become a significant income source for 7,596 farmers in Lumbini Province, with average coverage of 0.23 ha. The average cost of production is NPR 167/kg, with commercial farms achieving lower costs. Benefit-Cost Ratios (BCR) vary from 0.94:1 to 4.29:1, with an average of 2.12:1, indicating higher profitability to commercial aquaculture compared to small-scale farming. Key challenges include disease management, market competition, and fluctuating pricing. Addressing these issues through improved infrastructure and market support could enhance profitability and sector growth.

4.2 Policy recommendations

4.2.1 Policy recommendations related to reducing cost of dairy milk production and marketing

Study recommends problem solving related policy recommendations for production and marketing related constraints.

Spend 30% budget for housing and management: To address "Unscientific animal-keeping systems" and its impacts on CoP, study suggests to bring a "mission for scientific-shed management" focusing semi-improved and traditionally keeping dairy farms" by providing funding support, raising awareness about need of scientific farming system. By supporting in housing and management will reduce cost of production by two approaches: Firstly, it increases animal productivity and secondly it reduced cost for feed, roughages and water use and improved manure management. As this study estimated average investment NPR 1.7 million for scientific shed and share of scientific shed associated total capital investment is 70% of the total fixed capital. In this context, this study suggests to allocate at least 40% program budget of dairy cattle management for improved shed associated dairy animal keeping support. Bringing policy of at least 50% matching grant subsidy for small-scale and semi-commercial farms would be attracted into commercial ones. Additional suggestion is seeking low-cost sheds alternative to masonry-based technology.

Bring workable policy for local breed supply program by spending 30% budget: To address the issue of expensive milking cows and buffaloes, it is crucial for the Department of Livestock Services (DoLS) and the Directorate of Livestock and Fisheries Development (DoLFD) to implement a strong breed management program. We recommend allocating at least 30% of program budgets to strengthen breeding resource centers in Lumbini Province. Since farmers invest around NPR 1 million per animal, impacting milk production costs by NPR 30/litre, reducing these costs through better breed supply is essential. The centers should ensure the supply of 50%, 75%, or 100% pure breeds for buffaloes (Murrah) and cattle (Jersey, Holstein), transitioning to formally registered entities that maintain breed pedigrees. Support should evolve from partial grants to joint ventures or private-sector initiatives, with a focus on meeting farmers' demands. Collaborative efforts between government and non-government organizations are needed to ensure sustainability and profitability for farmers.

Strengthen weakness of present livestock extension system: To address the issue of "Poor technical and financial support, including inadequate extension services, high animal mortality, and low insurance coverage," The following actions are recommended to resolve weaknesses in implementation of extension services:

- Establish routine farm visits by dairy experts for all registered dairy farms and insured dairy animals;
- Organize routine veterinary clinic campaigns in pocket areas by linking students and faculties of Paklihawa Campus, Rupandehi;

- Organize tailored short-term training (business plan-oriented production and marketing system) and exposure visits, either free of cost or partially paid;
- Distribute adequate technical materials, published in Nepali, to improve accessibility;
- Facilitate farm-based data collection to better allocate input subsidies for small-scale farms; and provide both product-based subsidies and subsidized loan support for commercial farms;
- Reduce paperwork for technical experts and introduce field-based incentives for staff involved in on-site services;
- Mobilize Rapid Response Team (RST) in disease, parasite or other risk outbreak areas.

Promote a forage-based dairy farming system as mission: To address the issue of "Problems with fodder and insufficient land for raising nutritious forage and fodder trees," this study recommends implementing following micro-policies to implement mission program to promote a forage-based dairy farming system focusing on stall-feeding:

- Register and renew dairy farms based on a standard animal-to-grazing land ratio, ensuring that at least 60% of the diet comes from fodder trees and forage grasses.
- Secure and allocate quality land specifically for fodder and forage production.
- Regularly monitor forage farming areas to ensure the inclusion of both leguminous and non-leguminous grasses.
- Provide seeds, sets, or cuttings of forage grass at subsidized rates.
- Establish fodder and forage resource centers in each rural municipality for the consistent supply of seeds, sets, and cuttings.
- Continue the policy promoting silage production on all farms, with production-based subsidies for dairy/forage farms that sell high-quality silage.
- Emphasize that milk quality, lactation period, and productivity are directly dependent on proper feeding practices (look a case study in Appendix 15

Ensure subsidized loan with sufficient grace period upto payback period: To address “availability of subsidized loan and no grace period”, study kindly recommend easy availability of subsidized loan to the famers keeping animals, shed or business plan as collateral. A grace period should be defined based on the payback period and breakeven volume of dairy business plan so that dairy keeping farms would pay loan commitments of banks and financial institutions with their income, not the income from bank loan.

Organize training on dairy farming related sub-skills: To address other production constraints such as high labour cost and unavailability of skilled staff for dairy work, each farm entrepreneur should train staff on needy sub-skills required for handling dairy animals, milking, forage farming and dairy products manufacturing in collaboration with reliable training centres.

Bring short-term to long-term strategies and buyback program for milk marketing: To address “delay payments of their milk price from DDC based cooperative cannel” and majority of farmers were selling milk in this channel, study recommend short-to-long term strategies.

- The short-term marketing strategies that might work are selling raw milk to cooperative -> private dairies cannel to get payments on time or farmers could sell raw milk or locally made short-duration dairy products (paneer, ghee, yoghurt, butter milk) directly to nearest hotels or individual households;
- Long-term recommendation would be structural change of DDC-framework from semi-government model to private-community-DDC-government or PCDG model

- Since ultra-high temperature (UHT) Technology is successfully completed sample production event and 140 dairy cooperatives are connected under Specialist Cooperative Union Ltd. Rupandehi, this might be boon to make a buyback guarantee of collecting milk for long-duration keeping and selling flush season's supply in different market outlets.

Allocate production-based subsidy as a percentage of the cost of production: The DoLFD is suggested to introduce a production-based subsidy calculated as per percentage of the cost of dairy milk production. For instance, 10% of NPR 61 would amount to NPR 6.1/kg. It is essential to update the cost of production annually and provide incentives in a logical and transparent manner.

Struck monitoring of informal milk and dairy imports and revise custom duties: To ensure a coordinated supply chain with stable prices for homogenous products, this study recommend addressing trade related issues in buyback and forward-linked markets of dairy farmers:

- The Local Administrative Office, in coordination with local Veterinary Hospital and Livestock Service Knowledge Cetnre (VHLSKC) and dairy associations, is urged to monitor private dairies, particularly those near to border areas, and local vendors (Dudhiya), to restrict informal import of milk and dairy products from India.
- Given the existing stock of skimmed milk power, the Department of Customs and Trade and Export Promotion Centre (TEPC) are advised to halt the import of additional dairy products, temporarily. Additionally, a seasonal taxing policy on imported milk and dairy products should be considered to promote domestic products limit external competition;
- Department of customs should harmonize import tariffs on raw materials used for dairy animal feed manufacturing and silage wrappers to reduce cost of feed and silage, supporting lower production costs for local farmers.

Overall, to improve dairy milk production and marketing, it is crucial to strengthen both backward and forward-linked markets with dairy farmers in Lumbini Province as part of short-term and long-term strategy. The key factors driving the cost of milk production includes animal shed, capital assets, feed, roughages, labour, treatment, and electricity. Therefore, the **Ministry of Agriculture and Land Management, Lumbini Province, along with the Directorate of Livestock and Fishery Management Lumbini Province** is urgently requested to allocate balanced budgets for investment in five key areas:

- Housing and management, with 30% weightage in program budget
- Resource Centre and breed management, with 30% weightage in program budget
- Feed and forage management, with 20% weightage in program budget
- Animal health, treatment and sanitation, with10% weightage in program budget and
- Marketing management of dairy products, with 10% weightage in program budget

These investments should be targeted toward semi-formal to formally registered dairy farms, aligning with the "**Agriculture Investment Decade (2081-2091)**"initiative to ensure sustainable growth in the dairy sub-sector.

4.2.2 Policy recommendations related to reducing cost of goat meat production and marketing

These recommendations aim to improve the efficiency, safety, and profitability of goat meat production and marketing in Lumbini Province, benefiting farmers, traders, and consumers.

Ensure private or public extension services to provide instant technical services: To address "Inadequate technical support at goat farms" to reduce goat mortality rate due to diseases, parasites, toxic grasses during grazing and wild animal attack, study recommends to establish demand-based extension service (both private, government) to establish routine farm visits by goat production and breeding experts for all registered and insured goat farms. Study recommends to implement Farmer's Field School" for goat

growers with technical staffs in order to produce goat for meat purpose with using optimized costs. Thirdly, DoLFM, is further requested to organize routine veterinary clinic campaigns in goat pocket areas by linking students and faculties of Paklihawa Campus, Rupandehi. These farms need periodic training on goat business literacy development training including business plan-oriented production and marketing system and exposure visits. Additionally, they are required to connect into digital platform and provide applied knowledge and adequate technical materials, published in Nepali language. Establishment of sufficient dipping tanks, vaccination of PPR and mobilize Rapid Response Team (RST) in disease, parasite or other risk outbreak areas are strongly recommended.

To address **"Poor scientific goat keeping system due to inadequate technical and physical support at farms**" and positive impacts of shed management on goat keeping, the Directorate of Livestock and Fishery Management (DoLFD) is requested to bring a mission program of shed improvement by allocating 30% budget, with 50% matching grant support for improved shed management.

Strengthen breed improvement program in the district: To address "unavailability of quality goat breeds (both cross and pure)" and only 5% used improved goat farming in Lumbini Province, study recommend at least one breeding resource centres in the district for crossbreed or pure form for meat purpose (Khari, Boar, Sirohi, Beetal), dual-purpose breeds (milk, meat) and other feasible breeds that have high fecundity rates. Goat experts reported that locally available Khari is high-quality breeds for meat propose but has slow growth. In this context, crossbreeds of 50% or 75% is superior to local Khari. There is need of genetic improvement of goat species and bringing successful technologies for artificial insemination in does. For these works, DoLFD is requested to allocate at least 20% budget annually.

To address marketing constraints of goat meat in Lumbini Province, Study recommends following implementable suggestions:

Expand public-private investment in marketing infrastructure and develop a coordinated supply chain: To **e**nsure the supply of quality Chevon from quality sources, it is crucial to invest in marketing infrastructures, including slaughterhouses at both rural municipality and ward levels in the municipalities or a wet market facility in every agricultural stations. DoLFD, Butwal sub-metropolitan office and Muktinath Krishi Company Ltd. are strongly recommend to operate slaughterhouse in full phase and show the best model of public-private-community partnership for supplying diversified meat items of chevon. Develop and formalize supply channels through buy-back guarantees between those slaughterhouse operators, goat farming self-help groups and cooperatives. Ensure that all chevon sold is certified by veterinary professionals, ensuring food safety and traceability in the market.

- **Replicate successful goat-meat focused collection centres**: Encourage the replication of effective collection centres run by self-help groups or agricultural cooperatives, which have shown success in live goat marketing for meat and breeding proposes. These centers coordinate with members, provide holding and weighing facilities, connect with traders, negotiate prices, and operate on low commissions (Rs 10-20/kg of live weight). Their operational model should be expanded across districts in Lumbini Province to strengthen the supply chain and reduce marketing inefficiencies.
- **Raising awareness for meat users and butchers**: The DoLFD and VHLSKC are requested to increase awareness on using meat prepared by skilled butchers only. Also, consumers should be

educated on buying skinless goat meat consumption as far as possible in order to sell skins for hides making. The butchers need to trained on diversified meat items productions.

- **Allocate production-based subsidy as a percentage of the cost of production:** The DoLFD is suggested to introduce a production-based subsidy calculated as per percentage of the cost of goat meat production. For instance, 5% of NPR 417 would amount to NPR 20.85/kg. It is essential to update the cost of production annually and provide incentives in a logical and transparent manner.
- **Regular monitoring of slaughterhouses and fresh houses**: The DFQC, DoLFD and VHLSKC should regularly monitor the quality of meat sold at slaughterhouses and fresh meat shops. This monitoring should include both routine inspections and ad hoc checks to ensure compliance with meat safety standards and maintain consumer's confidence in the market.
- **Raise awareness among meat consumers and butchers:** Study further recommends additional points that might supports further in CoP and marketing. First, the DoLFD and VHLSKC should launch awareness campaigns promoting the use of meat processed by skilled butchers both in rural and urban areas, ensuring higher standards of hygiene and meat quality. Second, consumers should also be educated about the benefits of purchasing skinless goat meat to promote the use of goat skins for leather production. Finally, butchers should receive training in producing diversified meat products, expanding their business potential and reducing wastage in carcass.

Overall, to sustainably improve goat meat production and marketing, the Ministry of Agriculture and Land Management, particularly the Directorate of Livestock and Fishery Development Lumbini Province is urged to adopt a long-term investment strategy focused on enhancing both backward and forward-linked markets. Input based subsidies should be focused on key determinants influencing the cost of goat meat production include capital investment in improved sheds, goat procurement, feed and forage, labor, and treatment. Output-based subsidies should be based on annually updated cost of production. To address these, the ministry should implement a balanced budget across five critical investment pillars:

1. Housing and management, with 30% weightage
2. Breed improvement, with 20% weightage
3. Feed and forage management, with 20% weightage
4. Animal health (10%), with 10% weightage
5. Marketing management, with 10% weightage

This targeted investment policy, aimed at semi-formal and formally registered goat farms, should be implemented making success of "Agriculture Investment Decade (2081-2091)". These measures will support the province's goat farmers by improving production efficiency and market access, ensuring sustainable profitability for the goat industry.

4.2.3 Policy recommendations related to reducing cost of fish production and marketing

Ensure Effective Aquaculture Extension System in Fishery Pocket Areas: To address "sudden death due to fish diseases and parasites," which can increase CoFP by 5-30%, the study recommends expanding extension services through the Department of Livestock and Fisheries Development (DoLFD) and VHLSKC:

- Assign at least one fishery officer and two technicians in key fish producing districts, with rapid response team in the provincial top-up services;
- Implement "Aquaculture Field Schools (AFS)" to educate farmers on cost-efficient technologies.

- Conduct pond-based trips focusing on fish clinics, water quality, live feed production, probiotics, and enzymes. Provide technical supports to reduce mortality rates through the use of high-quality fish seed of fingerlings(normal age and advance), feeding aid and parasites control.
- Provide technical trainings with exposure on business planning, farm operations, and marketing in coordination with training centers, fishery associations, and Super zones/Zone committees**.** The farmers should be trained on selling at least 2 times a year production cycle from one cycle at this moment.
- Provide a policy mandate 50% subsidy for high density farming technologies (IPRS), repair and maintenance, and necessary tools and machinery and digitalize database and monitoring system.
- Develop rapid support mechanism to cope up for losses from drought and flood, (for 50% loss);

Increase subsidy ceiling for all types of aquaculture farming: To address "low investment capacity and the lack of balanced support or incentives for capital assets," the study recommends increasing the subsidy ceiling under PMMP's and the Directorate's programs. Firstly, raise the 50% matching fund subsidy ceiling from NPR 0.3-0.5 million to NPR 1.2 million for new pond construction, integration supports, and tools/machinery. Second, launch "a provincial directive for financing policy for small-scale aquaculture (SSA)" to upgrade them into commercial operations and reduce their production costs. Thirdly, tailor funding schemes based on fish farming typology, such as pond-fish, cage farming, raceways, rice come fish farming or bio flock technology.

Ensure water availability with subsidized electricity tariff: The Department of Livestock Services, Department of Water Resources, Energy, and Irrigation, and the Department of Industry should collaborate to ensure year-round access to quality water with a subsidized electricity tariff to help reduce production costs for fish farmers.

Optimize costs for factory feed use: To address the challenge of costly factory feed use, NARC and DoLFD should identify and promote local feed materials rich in nutrients, including over 25% crude protein (CP) and with an FCR of 2:1. Additionally, DoLFD is recommended to provide a 50% subsidy for pellet feed manufacturing machines (Sample photo 6) to semi-commercial and small-scale farms.

Photo 6: Low-cost machine for palate feed making at home

Further, ensure sufficient grasses and natural live feed production at farms[7]

Promote factory feed and supplements for cost-efficiency: Encourage commercial and semi-commercial farmers to use pellet feed (sinking for bottom feeders, floating for surface feeders) with over 25% crude protein. Probiotics and enzymes should be utilized to improve feed efficiency, and fast-growing species with better FCR should be prioritized over species like Rohu and Naini.

Optimize land rent while leasing pond or private land or water bodies: To address "CoP increased by land rent"**:** The study strongly recommends that the DoLFD coordinate efforts to:

- Declare fish zone areas and facilitate for uniform leasing rates within districts;
- Assure fixed leasing durations between fish farmers (tenants) and landowners;
- Exempt land tax for land rented for fish farming;
- Implement a legal framework to ease the leasing of public areas such as rivers, streams, lakes, dams, and swamps.

Ensure availability of right fish seed in a cost effective way: To address "fish seed mortality, unavailability of the right species, and costly seed", study recommends that CFPCC (Balaju and Bhairahawa), DoLFD, and VHLSKC coordinate efforts to:

i) Register and encourage fish nurseries and hatcheries to produce diversified fish species including carp, Pangas, Nile Tilapia, Ranbow Trout and local fish species;
ii) Provide quality broodstock of all species at subsidized rates;
iii) Encourage scaling up of fingerling and advanced fingerling production with low mortality (up to 5%) for demand-driven species[8]

Allocate production-based subsidy as a percentage of the cost of production: TheDoLFD is suggested to introduce a production-based subsidy calculated as per percentage of the cost of fish production. For instance, 10% of NPR 167 would amount to NPR 16.7/kg. It is essential to update the cost of production annually and provide incentives in a logical and transparent manner.

For marketing related constraints study recommends following suggestions as policy recommendations:

- In close coordination with the Ministry of Defense, Chamber of Commerce, Department of Customs, and Animal Quarantine Offices, the DoLFD is advised to control the informal trade of fish-specific production inputs, fresh and live fish, and fish-based industrial products. Further, facilitation is required for custom tariff revision for importable inputs including regulatory support to control of informal trade of fishery related feeds, seeds, machineries and products.
- The DoLFD should establish 5-7 wholesale markets in Lumbini Province in strategically chosen locations. Build up capacity of agricultural cooperative that might run fishery wholesale markets;

[7]Farmers should focus on producing natural live feed (e.g., phytoplankton, zooplankton, worms, *Azolla*, and *Artemia salina*) in pond water by supplying adequate manure, fertilizers, and micronutrients. For grass carp, farmers should plant protein-rich grasses such as Napier, para, alfalfa, hybrid sorghum, Sudan grass, and Stylo.

[8]Discourage the use of fry and hatchlings, which have high mortality (20-65%) that increasing production costs, ultimately.

- The DoLFD should built capacity of local fishery associations, and micro, small medium entrepreneurs (MSMEs) to develop a processing ladder and fish tourism development within the provincial fishery value chain[9.]
- Bring appropriate niche or branded fish products selling from Lumbini province
- Revise legal issue of establish ponds at border areas, that might increase fraud in production and sales
- Building up of capacity of live fish traders (Technology, training and support in well-fabricated transportation van);

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Overall, to sustainably improve fish production and marketing, the Ministry of Agriculture and Land Management, particularly the Directorate of Livestock and Fishery Development Lumbini Province is urged to adopt a long-term investment strategy focused on enhancing both backward and forward-linked markets. Input based subsidies should be focused on key determinants influencing the cost of fish production include capital investment in structure (pond, raceway, enclosure), factory feed and live feed management, labor, and treatment. Output-based subsidies should be based on annually updated cost of production. To address these, the ministry should implement a balanced budget across five critical investment pillars:

6. Fish production infrastructure, with 35% weightage
7. Fish seed and brood stock improvement, with 25% weightage
8. Feed, supplement, forage and live feed management, with 20% weightage
9. Treatment and water health, with 10% weightage
10. Marketing management, with 10% weightage

This targeted investment policy, aimed at semi-formal and formally registered aquaculture farms, should be implemented making success of "Agriculture Investment Decade (2081-2091)". These measures will support the province's fish growers by improving production efficiency and market access, ensuring sustainable profitability for the fishery industry.

[9]Value addition can be done under two approaches: First, motivate aquaculture farms to integrate income-generating activities, such as fish tourism, fish village, resort, swimming, and sport facilities; Second, provide training and encouragement for value addition activities, including drying, blast freezing, canning, and the production of industrial products (e.g., fish fillets, fish oil, sausages, patties, surimi, collagen, and gelatin).

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APPENDICES

Appendix 1: Semi-structured Questionnaire for milk producers

Respondent Code # Date of survey:……

Respondent general information

Name of dairy cattle owner …….. Age:
Address: District:
Contact number: …….
Organization name (if has):
Dairy cattle farming experience (in month and year):
Organization: Farmer's group / Cooperatives/ Firm/Company
Farming type**:** Subsistence/semi-commercial/commercial
Types of dairy feeding: Install feeding / grazing /both
Types of animals: Buffalo/Cow
Types of breeds: Local/Improved/Cross/ Pure

A. Fixed assets costing

Area used in shed preparation:
Area used in forage and fodder production
Types of farming:
Types of land: fallow, residential, farmed low/upland
Valuation of land occupied by shed area:

Fixed cost information of at least five years (from 2076/77 to 2080/81)

Fixed cost items	Unit	Beginning (Year 1)	Yr 2	Yr 3	Yr 4	Yr 5	Subsidy grant (if has)	Working life of assets
1.Cattle shed types	No							
Improved	No							
Semi-improved	No							
Hut /traditional	No							
Land rent or revenue amount	Rs							
2.Water management								
Tank (plastic, cement, overhead)	No							
Plastic pipes	No							
Tube well, water pump	No							
Boundary/fencing	Mt							
Feed management	Rs							
Manger								
Feed making machines								
Other feeding device/tools								
Infrastructures								
Link road								
hump pipes								
Shed upgrading								
Tools /machineries								
Spade/sickle								
Ropes/ iron chains for animal control								
Industrial assets								
Deep freeze/freeze								
Refrigerator								

Milk Can								
Motorcycle								
Cycle								
Delivery van								
Staff expenses								
Salary of permanent staff								
Staff insurance								

B. Estimated depreciation value for a farm:

Working capital expenditure

S.N	Name of species	Number	Lactation (if has)	Rate	Amount	Estimated rearing time
1	Milking Cow Pure					
	Milking Cow cross					
2	Milking cow local					
3	Milking Buffalo pure					
4	Milking buffalo cross					
5	Milking buffalo local					
6	Pregnant dairy cattle					
7	Draft animal					
8	He-buffalo					
9	Calves					

P =Pure, C= Cross , L= Local

C. Variable cost (Shrawan 2080 to Asar 2081)

C.1 Feed, supplements plus and forage/grazing management

S.N.	Particular	Unit	Qnt	Rate	Use duration	Amount (Rs)	Subsidy amount (if)
1	**Feed & supplement**						
1.1	Home-made feed						
1.2	Grain (maize, barley)	kg					
1.3	Rice bran	Kg					
1.4	Factory byproduct						
2	Factory feed (domestic)	Kg					
3	Indian feed (if has)	Kg					
4	Enzymes	Kg					
5	Vitamin	Kg					
6	Minerals	Kg					
7	Straw	Bundle					
8	Dry grass or hay	Bundle					
9	Silage	Kg					
10	Grass seed	Kg					
11	Fodder sets	No					
12	Fodder trees plantation	No					
13	Fertilizer (Urea, DAP)						

C.2 Labor cost

S.N.	**Particular**	**Unit**	**Qnt**	**Wage rate**	**Duration**	**Amount (Rs)**
1	Family labor	No				
2	Hired or temporary labor	No				
3	Skilled or expert hired	No				
4	Treatment cost /Dr cost	No				

Labor means sum of labor required for daily requirements of fish rearing repair etc

C.3 Climate change, loss and risk management cost

S.N.	**Particular**	**Unit**	**Qnt**	**Rate**	**Price**	**Amount (Rs)**	Any subsidy/damage claim gain
1	# of dead animals (LSD, or other causes)						
2	Shed loss due to Flood, landslide, wind)						
3	Antibiotics, disease medicine	Times					
4	Vaccine (FMD, BQ, LSD)						
5	Insurance premium	Rs					
6	Additional loan /interest rate	Rs					
7	Other						

C.4 Repair and maintenance

S.N.	Particular	Unit	Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Shed repair	**Rs**				
2	Store	**Rs**				
3	Tools /machinery	**Rs**				

C. Other expenses

S.N.	Particular	Unit	Qnt	Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Material transport						
2	Live animal transport						
3	Milk and dairy product transport						
4	AI cost						
5	Electricity	**Month**					
6	Communication						
7	Interest of loan	**Rs**					
8	Tax						
9	study/research						
10	Communication						
	Sub-total						

D. Income estimation (Shrawan 2080 to Asar 2081)

Milk and dairy products or by-products	Qnt sell	Ready to sell#	Rate	Amount	Sale to whom
Cow milk					
Buffalo milk					
Other dairy products					
Manure					
Live animal sale					
Calf sell					

E. Production and marketing problems

Please rank production to marketing constraints (5 point scale: 5 as High and 1 as low importance)

S.N	Top three milk production problems	Value of loss	Rank
1			
2			
3			
	Top five marketing problems of milk and dairy animals		
1			
2			
3			

Appendix 2: Questionnaires for Goat Meat Growers

Respondent Code # Date of survey:……

Respondent general information

Name of Goat keeping owner …….. Age:

Address: District:

Contact number: …….

Organization name (if has):

B. Specific information

B.1 Goat farming experience (in month and year):

Organization: Farmer's group / Cooperatives/ Firm/Company

Farming type: Subsistence, semi-commercial and commercial

Types of goat farming: Install feeding / grazing /both

Area used in shed preparation:

Area used in forage /feed

Breed type: Khari/Boar/Jamunapari or mixed farm:

Cost information of at least three years (from 2077/78 to 2080/81)

Fixed cost items	Unit	Beginning (Year 1)	Yr 2	Yr 3	Yr 4	Yr 5	Subsidy grant (if has)	Working life of assets
Goat shed types	No							
Improved								
Semi-improved								
Local								
Land rent or revenue amount (Rs)								
Deeping tank preparation								
Boundary/fencing								
Water management (Swall tube, tap install/ etc)								
Overhead tank								
Plastic Tank								
Tatno prepare								
Feed making machines								
Feeding device								
Link road or hump pipes								
Shed upgrading								
Local tools								
Staff insurance								

Salary of permanent staff								
Vehicle								
Cycle								
Motorcycle								
Working capital for rearing								
Doe								
Kids								
Intact								

Estimated depreciation value for a farm:

Working capital expenditure

S.N	Name of species	Number	Estimated weight	Rate	Amount	Rearing began	Estimated rearing time
1	Pure intact (He-goat)						
	Pure castrator						
2	Cross intact						
3	Cross castrated						
4	Local bucks						
5	Local castrated						
6	Kids (pure)						
7	Kids (Improved)						
8	Kinds local						
9	Old aged doe						

P =Pure, C= Cross , L= Local

B.2 Feed, supplements plus and forage/grazing management (Shrawan 2080 to Asar 2081)

S.N.	Particular	Unit	Qnt	Rate	Use duration	Amount (Rs)	Subsidy amount (if)
B.3.1	Homemadefeed						
	Grain	kg					
	Bran	Kg					
	Soyabean						
	Factory by-products (flour, coats, etc)	Kg					
	Stale /leftover food						
B.3.2	Factory feed (domestic)	Kg					
B.3.3	Indian feed (if has)	Kg					
B.3.5	Enzymes	Kg					
B.3.6	Vitamins/Minerals	Kg					
	Forage /fodder						
B.3.6	Grass seed	Kg					
	Fodder sets	No					
B.3.7	Fodder trees plantation	No					
	Fertilizer						
	Manure						

B.3 Labor

S.N.	Particular	Unit	Qnt	Wage rate	Duration	Amount (Rs)
1	Family labor	No				
2	Hired or temporary labor	No				
3	Skilled or expert hired	No				

Labor means sum of labor required for daily requirements of goat rearing repair etc

B.4 Climate change, losses and risk management costs for goat rearing

S.N.	Particular	Unit	Rate	Price	Amount (Rs)	subsidy/damage claim gain
1	# of animal losses or kidnapped by leopard, cheetah, tiger)					
2	Animal attack					
3	Shed loss					
4	Additional loan interest losses					
5	Vaccine (PPR)	Times				
6	Antibiotics and medicine	Times				
7	Parasite and disease treatment cost	Times				
8	Insurance premium	Kg				
9	Other (specify)					
	Sub-total					

B.5 Repair and maintenance

S.N.	**Particular**	Unit	Qnt	Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Shed repair	no					
2	Store	No					
3	Tools /machinery	No					

B.6 Other or office expenses

S.N.	Particular	Unit	Qnt	Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Electricity	Month					
2	Interest of loan	Rs					
3	Breeding changes	Times					
4	Transport cost	Times					
5	Tax	Rs					
6	Study/research	Times					
7	Communication	Monthly					
8	Guest reception	Times					
	Sub-total						

B.7 Other expenses related to integrated goat keeping

Name of enterprises	Fixed cost (Rs)	Variable cost	Total cost	Remarks
Grain/vegetable farming				
Sheep farming				
Layar farming				
Meat animals				
Total cost for integration				

Income estimation (Shrawan 2080 to Asar 2081)

Meat type	Rearing period (Month)	Sold #	Ready to sell#	Estimated quantity of sale	Avg Sale price
Intact					
Castrator					
Kids					
Grass					
Manure					
Old doe					

Other benefit from integrated farming

Name of enterprises	Unit	Quantity	Rate	Amount
Vegetable farming				
Livestock				
Layers				
Total benefit				

Top three production and harvesting problems

Please rank production to marketing constraints (5 point scale: 5 as High and 1 as low importance)

S.N	Production problems	Value of loss	Rank
1			
2			
3			
	Top five marketing problems		
1			

Appendix 3: Questionnaire for Fish Growers

Respondent Code # Date of visit:……

Respondent's general information

Name of pond-head owner …….. Age:
Address: District:
Contact number: …….
Organization name (if has):
Farmer's group / Cooperatives/ Firm/Company
Number of share-holders (in cooperatives/company):
Fish farming experience (in month and year):
Types of aquacultures: Pond fish/raceway/cage
Types of production system: Carp polyculture/pangas /carp-pangas polyculture

B. Fixed cost-specific information

(Note: Cost information of beginning year, to last five years 2077/78 to 2080/81) in order to estimate depreciated value)

B.1 Land types, rent or digging cost with subsidies

Gross area	#	Gross area (Ha)	Water area (ha)	Ownership of land (ha)			Duration of use	Rent / excavation cost	grant/ subsidy (NRs)
				Own size	Rented in	Rented out			
Nursery pond									
Rearing pond									
Brood stock pond									
Production pond									
Total									

Note: **Nursery fond** for production of advance fry from hatchling, rearing pond for the production of advance fingerlings (> 10-25 gm), Broodstock pond for keeping hatchery and rearing for breeding purpose and production pond for rearing fish for harvesting purpose.

Types of land: Rice-wheat farming converted/Swamp /community pond
Latest land valueof that area: (NRs):

B.2 Other fixed assets used for fish farming

Fixed cost items	Unit	Beginning (Year 1)	Yr 2	Yr 3	Yr 4	Yr 5	Subsidy grant (if has)	Working life of assets
1.Land rent or excavation								
2. Area expansion/upgrading cost								
3.Shed/store house								
4. Boundary /fencing								
5. Water management								
Deep tubewell								
Shallow tubewell								
Water pump/ (motor for water lifting)								
Irrigation canal								
Pipe								
Overhead tank								
Tank (Plastic, concreate)								
Pond inlet/outlets								
6. Other machinery and tools								
6.1 Local tools and utensils								
Spade/knife /sickle								
Feeding devices								
Wooden /iron poles								
Plates								
6.2 Machinery/Industrial assets								
Aerator (size and type, if has)								
Deep freeze / refrigerator								
E-Balance								
Generator								
Wire								
Poles for electricity								
Feed mixture/grinding machine								
Fishing nets (seine, fry, pond cover)								
Water quality test device								
6.3 Transport or tillage assets								
Fish transportation tank								
Tractor/power tiller								
Cycle								
Moter cycle								
Delivery pick-up								

Car								
7. Other infrastructures								
Link road for vehicle								
Hump pipes								
8.Other assets in office								
Salary of permanent staff (No and salary (NRs)								
Staff insurance (NRs)								
Computer and other gadget								
Furniture (chair, table								
Miscellaneous								
Sub-total of capital cost								

B.3 Estimation of depreciation value

Types of assets	Book value (Rs)	Working life	Estimated salvage value NPR) (10% at the end of 5th year)	Salvage rate	Value*
Pond				1%	
Store /feed house				1 -5%	
Deep tubewell				10%	
Swallow tubewell				5%	
Local tools				5%	
Equipment & Machineries				10%	
Industrial tools				20%	
Other				10%	

*Note: Diminishing balance method: (Book value * salvage rate). It is estimated for working life of assets.

C. Variable cost in FY 2080/81

C.1 Fingerling cost

S.N	Name of species	Number	Types H, Fr/ Fi/AF	Rate	Amount	Release time in pond	Mortality rate
1	Common carp						
2	Grass carp						
3	Bighead carp						
4	Silver carp						
5	Rohu						
6	Naini/Mrigal						
7	Bhakur/Catla						
8	Pangus						
9							
10	Other						

H= Hatchling, Fr= Fry, Fi= Fingerlings, AF= Advance fingerlings

C.2 Feed, supplements and Pond fertility management

S.N	Particular	Unit	Qnt	Rate	Use duration	Amount (Rs)	Subsidy amount (if)
1	**Feed and supplement**						
1.1	**Home made**						
	Oil cake	kg					
	Rice bran	Kg					
	Whear, maize flour	Kg					
	Soybean flour	Kg					
	Other locally available ingredients	Kg					

	(specify)						
1.2	**Factory feed (domestic)**	Kg					
	Sinking pellet						
	Floating pellet						
1.3	**Indian source feed**	**Kg**					
	Sinking pellet						
	Floating pellet						
1.4	Probiotic	Kg					
1.5	Enzymes	Kg					
1.6	Vitamins/Minerals	Kg					
1.7	Micronutrient supplement	Kg					
1.8	Natural food/nutrient						
1.9	Grass seed /forage if has	Kaththa					
1.10	Manure (FYM)						
1.11	Fertilizer (DAP, Urea)						
1.12	Azola farming (area)						
1.13	Other (please specify)						
	Sub-total						

C.3 Labor and expert expenses

S.N.	Particular	MD qnt	Wage rate	Duration	Amount (Rs)
1	Family labor				
2	Hired or temporary labor				
3	Skilled or expert hired				
4.	Treatment cost of expert				

Labor means sum of labor required for daily requirements of fish rearing activities, repair and maintenance etc.

C.4Parasite and disease management: Chemicals for disease/parasite & wild animal protection (snake and bird control)

S.N.	Particular	Unit		Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Lime purchase	Kg					
2	Parasitoids	Kg					
3	Fungicides	kg					
4	Antibiotics	gm					
5	Pond bottom cleaning /disinfection agent ……						

B.5 Expenses in repair and maintenance cost due to flood, environment or water scarcity

S.N.	Particular	Unit	Rate	Price	Amount (Rs)	Mention any subsidy/grant amount
1	Dike repair	Rs				
2	Re-excavation /de-sedimentation	Rs				
3	Water drainage cost	Rs				
4	Repurchase fingerlings /fish seed	Rs				
5	Dike protection (Seal Poulin plastic /concreate)	Rs				
6	Store, infrastructure	Rs				
7	Tools /machinery	Rs				
8	Water tariff due to	Month				

	drought					
9	Fish insurance premium (Rs)	Rs				
10	Additional loan interest					
11	Net repair & replacement					

If ponds are maintained in a time interval (once in 3 yr, total cost has to be divided by number of years.

B.6 Other administrative expenses

S.N	Particular	Unit	Rate	Price	Amount (Rs)	If subsidy is getting mention qnt and price
1	Electricity tariff (Rs	Month				
2	Interest of loan	Rs				
3	Income Tax (gov, liability)	Rs				
4	Fuel cost	Rs				
5	Transport cost	Rs				
6	Custom hiring rent	Rs				
7	Communication cost	Rs				
8	Other cost: study/ research	Rs				
	Sub-total					

B.7 Other expenses related to integrated farming

Name of enterprises	Fixed cost (Rs)	Variable cost	Total cost	Remarks
Gran/vegetable/pulse farming				
Cow /buffalo/pig farming				
Poultry /duck farming				
Paddy				
Shellfish (prawn)				
Total cost for integration				

Income estimation

Fish type	Duration of keeping/raising (Month/year)	Times of harvesting in a year (Times)	Total Qnt harvested (Kg)	Sell quantity (Kg)	Marketing types*
Common carp					
Grass carp					
Bighead carp					
Silver carp					
Rohu					
Naini/Mrigal					
Bhakur/Catla					
Pangus					
Other integrated enterprises					

*Mode of marketing: self-sale (hat bazar, local market) or sold to traders (wholesale, Retail, Cooperative sale).

Marketing status, sell-types, prices and channel

Name of enterprises	Live sale		Fresh sale (Local/distant		Cost (Rs/cost	Average price (Rs/kg
	Volume (kg)	Farm get price	Volume (kg)	Farm get price		
Common carp						
Grass carp						
Bighead carp						
Silver carp						
Rohu						
Naini/Mrigal						

Bhakur/Catla						
Pangas						
Other integrated enterprises						

G. Challenges and opportunity in production and marketing of carps and pangas

Issue/opportunities	Table fish production-Carps	Table fish production-Pangas	Rank
Detail history of farm (how the owner inspired to begin aquaculture, gradual changes in production system and size of the farm, etc,).			
Policy (both existing policy that favor/constraint to farmers and the policy that deemed necessary).			
Subsidy and policy incentives (available at present, and demanded)			
Inputs supply Fish seed and mortality Fish feed and supplements Tools and equipment Technical Service			
Production Land issue Water shortage Labour Electricity tariff Disease and management Drainage			
Marketing system (market network & product supply chain) • Timely sale and maintain sale-production cycle • Price • Marketing cost			
Future opportunity			
Photograph of farm/activities			

Appendix 4: Checklist for Key Informant Interview (KII) with Institutional Organization

(Council, Directorate, Veterinary Hospital & Liv. Service Center, Entrepreneur's Association).

Name of Expert
Position:
District: Date of KII:
Area of expertise:

Name of enterprise: Milk/Meat/ Fish

Do you have experience or study of "cost of production" estimation for animal products

Products	Small-scale producers (< 5 animals, or 0.3 ha fish farm)	Semi-commercial (5-10 animals, 0.3-1.0 ha farm)	Commercial >10 animals, >1 ha fish farm)
Buffalo milk			
Cow milk			
Goat meat			
Carp species			
Tilapia			
pangas			
Trout			

2. Do you have crop-cutting survey of these three enterprises. If has, give report on any of milk/meat/fish species
3. What factors are responsible to increase cost of production of
milk (cow, buffalo:
meat (goat):
fish species:
4. Are there any production or input based subsidy programme to reduce cost of milk, meat and fish species?
5. What are the five key problems in production and marketing of animal products (also rank these)?

S.N	Production problem	Rank	Marketing problems	Rank
1				
2				
3				
4				
5				

Any comments for reducing cost of production of these animal products?

1. Cow milk …… Buffalo milk……..
2. Goat Meat Fish species:

Appendix 5: Checklist for FGD with milk production supported organizations

(Producer group, cooperative, Entrepreneur's Association or marketing management committee).

Name of organization:

District: Date of FGD:

Enterprise: Raw Milk production

Name and position of participants:

1 2
3 4
5 6
7 8
9 10

Do you have experience or estimated "cost of production" for milk and milk products?

If yes, please mention cost of production of following milk and milk products in different farming level.

Products	Small-scale producers (< 5 animals' herd)	Semi-commercial (5-10 animals' herd)	Commercial (>10 animals' herd)
Buffalo milk			
Cow milk			

3.What factors are responsible to increase cost of production of milk (cow, buffalo),

4. Are there any production or input based subsidy programme to reduce cost of milk?

5. Please rank five key problems in production and marketing of any of milk products?

S.N	Production problem	Rank	Marketing problems	Rank
1				
2				
3				
4				
5				

Any comments for reducing cost of production of milk products?

1. Cow milk …… Buffalo milk……..

Appendix 6: Checklist for FGD with goat meat supported organizations

(Producer group, cooperatives, Entrepreneur's Association or marketing management committee).

Name of organization:

District: Date of FGD:

Enterprise: Goat Meat

Name and position of participants:

1	2
3	4
5	6
7	8
9	10

Do you have experience or estimated "cost of production" for goat meat? If yes, please mention cost of production of following farming level.

Products	Small-scale producers (<20 animals' herd)	Semi-commercial 20-50 animals' herd)	Commercial (>50 animals' herd)
Local breed (Khari)			
Cross breed Khari+Jamuna….)			
Improved breed (Boar, Jamunapari)			

3.What factors are responsible to increase cost of production of goat meat?

4. Are there any production or input based subsidy programme to reduce cost of meat?

5. Please rank five key problems in production and marketing of goat meat??

S.N	Production problem	Rank	Marketing problems	Rank
1				
2				
3				
4				
5				

Any suggestions for reducing cost of production of goat meat?

1. …… 2…….. 3.

Appendix 7: Checklist for FGD with Fishery-supported Organizations

Producer group, cooperatives, Entrepreneur's Association or marketing management committee).

Name of organization:

District: Date of FGD:

Enterprise: Fish production

Name and position of participants:

1 2
3 4
5 6
7 8
9 10

Do you have experience or estimated "cost of production" for any fish species? If yes, please mention cost of production of following fish species in different farming level.

Products	Small-scale producers (0.3 ha fish farm)	Semi-commercial (0.3-1.0 ha farm)	Commercial (>1 ha fish farm)
Exotic carp			
Indigenous carp			
Nile Tilapia			
Pangas			

3.What factors are responsible to increase cost of production of above fish species?

4. Are there any production or input based subsidy programme to reduce cost of fish production?

5. Please rank five key problems in production and marketing of fish species?

S.N	Production problem	Rank	Marketing problems	Rank
1				
2				
3				
4				
5				

Any Suggestions for reducing cost of production of fish species?

Carp species
Pangas ……..
Nile Tilapia
Rainbow trout

Appendix 8: Inception Meeting Attendance

Inception Meeting

आज मिति ०७९/११/३ गतेका दिन २:३० बजे लुम्बिनी प्रदेश पशुपन्छी तथा मत्स्य विकास निर्देशनालय बुटवलको सेमिनार हलमा निर्देशनालयबाट सिद्धार्थ इन्स्टिच्युट अफ रिसर्च एण्ड कन्सल्टेन्सी प्रा. लि. लाई Production Cost Analysis of Milk, Goat Meat & fish को अध्ययनार्थ दिइएको ToR र प्रोपोजल बमोजिम Inception Meeting मा परामर्शदाता [illegible] SIRACS बाट [illegible] निर्देशक डा. प्रकाश सिंह कुँवर तथा अन्य विज्ञ [illegible] कार्यालयका प्रमुखहरूको उपस्थितिमा Presentation भयो। Inception Meeting मा निम्न महानुभावहरूको उपस्थिति रह्यो।

उपस्थिति

१- डा. प्रकाश सिंह कुँवर नि. निर्देशक पशुपन्छी तथा म. वि. नि.
२- श्री [illegible] व. प. वि. ,, ,,
३- श्री रिन बहादुर थापा व. क. वि. अ. ,, ,,
४- डा० अर्जुन खनाल NISDP
५- श्री [illegible] प्रमुख [illegible]
६- श्री विरेन्द्र चौधरी व. प. वि. अ. ,, ,,
७- श्री तुलसीराम भण्डारी SIRAC
८- श्री [illegible] बहादुर के.सी. SIRACS
९- श्री कमल प्रसाद भण्डारी SIRACS
१०- डा. गोकर्ण [illegible] पन्थी SIRACS
११- [illegible] SIRACS
१२- [illegible] ०. ०. [illegible]
१३- नरेन्द्र पौडेल DOLFD
१४- [illegible] पन्थी SIRACS.
१५- [illegible] आचार्य DOLFD
१६- [illegible] ,,
१७- [illegible] शर्मा ,,
१८- [illegible] खनाल DOLFD
१९- श्याम राज कार्की

१९. [illegible] पशु [illegible] उप-महानगरपालिका [illegible]

२०.
21 [illegible] – [illegible]
22 अकबर अली – ,, ,, ,,
23 [illegible]
24 नरेन्द्र ब बोगटी [illegible]
25 सेलीन खान [illegible] कार्यालय

Appendix 9: Photos of inception workshop

Appendix 10: Photos of household survey and discussions

FGD at Cooperatives, Papara, Arghakhanchi

FGD with Dairy Cooperatives, Bandaganga Kapilvastu

Photo of household survey in Banke

Pangas observation in Chhapia,
Farm: Tara Pandey

Appendix 11: Specification of inputs, planned days and time with lead role

Planned Activities	Expected duration		Tentative working week						Lead role
		Baisakh 3rd wk	Jetha 1th wk	Jetha 2nd wk	Jetha 3rd wk	Jestha last wk	Asar 1st wk	Asar 2nd wk	
Review of studies	1 week	|<-->|							TL, Experts
Organize inception meeting Outline the detailed methodology and work plan (via inception report).	1 week	|<-->|							SIRAC S Nepal
Appoint enumerators and experts and mobilize them for primary and secondary data collection.	3 weeks		|<-->|						TL, Enumerators, experts
Analyze data, prepare and submit draft report	2 weeks			|<-->|					TL and experts
Organize a workshop and present key findings and recommendations within office team	1 week						|<-- >|		TL & SIRAC S team
Submit final report	1 week							|<- >|	TL
Total	9 weeks								

Appendix 12: Study Team and Enumerators

S.N.	Name of Experts	Position	Expertise	Key role
1	ThaneshwarBhandari	Team Leader	Ag. Economist	Prepare inception report, design questionnaires, conduct FGD and KII (Palpa, Rupandehi, Nawalparasi, Arghakhanchi), data analysis, report presentation, and finalization of report
2	Tusiram Bhandari	Livestock Expert	Livestock Management	Present inception report, conduct FGD and KII (Palpa, Rupandehi, Arghakhanchi, Banke and Bardiya) and finalization of report
3	Suresh K. Wagle	Fishery expert	Fishery breeding and management	Present inception report, conduct FGD and KII (Rupandehi Kapilvastu) and finalization of report
4	Gandhi Raj Upadhaya	Meat Expert	Vet Science	Conduct FGD and KII as well as facilitation to prepare report
5	Lil Bahadur K.C.	Data analyst	Mathematics Management	Recruited and mobilised study team, conducting FGD and KII, conducted data analysis, prepare draft report and finalised the report.
6	Tikaram Ghimire	Manager	Administration	Involved in FGD and KII (Palpa, Rupandehi, Nawalparasi), and team management
7	Krishna Gyawali	Computer expert	Computer Typing	Typing questionnaires in Nepali, Assisted in data analysis and report typing
8	Kedar Poudel	Enumerator		Conducted household survey in Kapilvastu and Arghakhanchi
9	Padam Bhandari	Enumerator	Health education	Conducted household survey in Nawalparasi, Rupandehi and Palpa
10	Rukmani Bhandari	Enumerator	BBS	Conducted household survey in Nawalparasi and Rupandehi
11	Aashis Chaudhary	,,	ISc (ag)	Conducted household survey in Banke and Bardiya
12	Subash Kumar Budha	,,	,,	Conducted household survey in Banke and Bardiya

Appendix 13: Types of variable assets and expenditures in milk production

S.N.	Types of cost	Total	Average	Min	Max	Share in variable cost (%)
1	Feed and supplement	28061440	445420	29200	6573000	40
2	Roughages (Straw, dry grass, silage)	12077142	163205	3750	975000	17
3	Labor (daily wage of unskilled and trained expert and calculated for family	14409450	202950	6200	559500	21
4	Treatment, insurance and losses	8643410	116803	900	1800000	12
5	Other costs (Repair, maintenance, transport, communication, tax, interest)	6237944	84297	5500	1263000	9
	Grand total	69429386	938235	122600	8569250	100

Source: Household survey 2080/81

Appendix 14: Benefit Cost Ratio Analysis technique for milk production

Variables	Year0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Remarks
Average Income		2465734	2465734	2589021	2718472	2854395	Income appreciation rate (5%
Dis. Income		2241576	2037797	1945170	1856753	1772355	Discount rate 10%
Avg. Variable cost		802488	1003911	1074185	1149378	1229835	
Dis. Cost		546273	531374.4	516882	502786	489073	
Average Fixed cost	2610654						
B.C ratio	1.89						

Appendix 15: Case study of dairy Entrepreneur Mr Yagyamurti Khanal, Rupandehi

This case study was prepared based on a key informant interview (KII) conducted on Jestha 32, 2081, with Mr. Yagyamurti Khanal, a most successful entrepreneur having over 30 years farming experience of mixed farm including buffaloes and cows. His farm is recorded most renounced "Breeding Resource Centre" in Rupandehi. His gross farm size is 5 hectare and has keeping milking animals, heifer and calves of more than 50 animals, which are mostly managed by six regularly paid staff.

Feed and forage feeding

Mr. Khanal uses an equal feed and forage formulation for both his milking cows and buffaloes. Daily diet of each milking animal is 20 kg silage, 5 kg dry grass (straw or Bhusa), 5 kg forage and fodder grass,12 kg feed. The monthly expenditure on minerals and vitamins is around NPR 500 per animal, all equivalent NPR 1180. His 70% of total spending goes to feed and foragewhile the remaining 30% covers his fixed and working capital costs. Among green grasses, he feeds 50:50 ratio of leguminous and non-leguminous forages produced in his 6.5 Bigha land. He also prepares silage and sell it as per demand.

Cost of production, income and animal productivity

His lean-season daily milk production is 400 litres: 250 litres from cow and 150 litre from buffalo. He usually milks 15-25 litre raw milk daily upto nine months per lactation from an animal and has reported equal amount of milk productivity between improved cow and buffalo. 25 litre milk in first six month and 15 litre in last three months. His cost of milk production was Rs 50-55 for a litre. First six-month he earns profit upto 35% and last three month's he estimated no break-even condition, i.e. cost= income. Per buffalo minimum income is NPR 1800 and cow is 1425, with profit 50% to 21% per litre of buffalo and cow respectively. However, his annual loss is estimated about 10% of income from animal diseases and parasites including 3% from Mastitis.

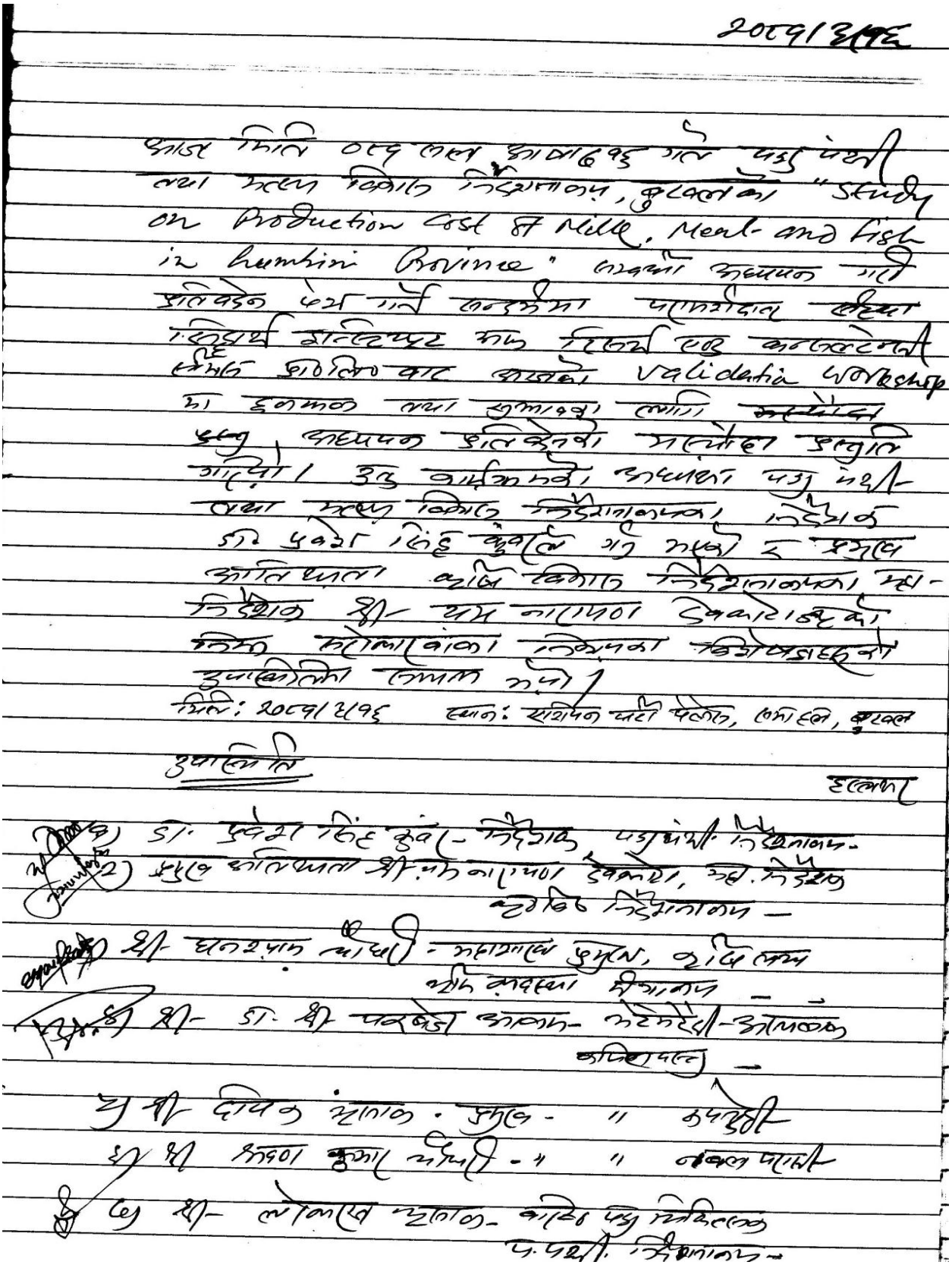
Milk marketing and prices

He is considered as "brand for quality milk production" in Rupandehi. He sold 150 litre milk directly from farm to the customers and other 550 litreto hotels. His selling price is NPR 120 per liter for buffalo milk and NPR 95 per liter for cow milk.

Overall progress and suggestions

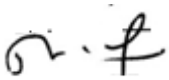
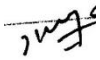
Mr. Khanal has received numerous local, national, and international awards for his achievements in dairy farming. His cost of production is low because of getting matching grants and project-based subsidies provided by the government agencies. While generally satisfied with the dairy farming business, he continues to face challenges. One major issue is the rising cost of artificial insemination (AI) services due to the increasing number of estrus cycle repetitions in buffaloes. He has found that using buffalo bulls is more effective than relying solely on AI.Additionally, Mr. Khanal is actively lobbying for a production-based subsidy and advocating for subsidized loans with grace periods to ease loan repayment. He also recommends that the Directorate of Livestock and Fishery Development maintain its silage promotion policy and increase the frequency of farm visits by technical experts to provide ongoing support and advice.

Appendix 16: Attendance in final presentation of study



Appendix 17: Photos of Validation Workshop at Asian Hotel, Rupandehi on 16th Asar 2081

Appendix 18: List of Study Team

S.N.	Name of Experts	Position	Expertise	Signature	Remarks
1	Thaneshwar Bhandari	Team Leader	Ag. Economist		
2	Tusiram Bhandari	Dairy Expert	Livestock		
3	Suresh K. Wagle	Fishery expert	Fishery breeding and management		
4	Gandhi Raj Upadhaya	Meat Expert	Vet Science		
5	Lil Bahadur K.C.	Data analyst	Mathematics Management		
6	Tikaram Ghimire	Manager	Administration		
7	Krishna Gyawali	Computer expert	Computer Typing		

Date: 2081/03/16

To whom it may concerned

It is to informed that I had worked for a title: “Study on Cost and Benefit Analysis of Milk, Meat, and Fish Products In Lumbini Province, Nepal”, as a Team Leader of Siddhartha Institute of Research and Consultancy Service Pvt. Ltd for a short-term consulting work of Directorate of Animal and Fishery Development, Ministry of Agriculture and Land Management, Lumbini Province.

(Thaneshwar Bhandari)