PRODUCTIVITY ANALYSIS OF COW FARMING IN CHANDRAGIRI MUNICIPALITY OF KATHMANDU VALLEY

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LETTER OF RECOMMENDATION

This thesis entitled ***Productivity Analysis of Cow Farming in Chandragiri Municipality of Kathmandu Valley*** has been prepared by **Ms. Sukriti Aryal** under my supervision. I hereby recommend this thesis for examination by the Thesis Committee as a partial fulfillment of the requirements for the **Degree of Master** of **Arts in Economics**.

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APPROVAL LETTER

We member of thesis committee, evaluated the thesis entitled ***Productivity Analysis of Cow Farming in Chandragiri Municipality of Kathmandu Valley*** prepared by **Ms. Sukriti Aryal** to the Central Department of Economics, Faculty of Humanities and Social Sciences in partial fulfillment of the requirements of the degree of **Master of Arts** in **Economics** have found satisfactory in scope and quality. Therefore, we accept this thesis as a part of the Degree.

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At last, I bear sole responsibility for any errors and discrepancies that might have occurred in the study.

Sukriti Aryal

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ABBREVIATON AND ACRONYMS

AI	Artificial Insemination
CBS	Central Bureau of Statistics
CD	Cob-Douglas
FAO	Food and Agriculture Organization
GDP	Gross Domestic Production
MoALD	Ministry of agriculture and livestock development
MPP_{La}	Marginal Physical Productivity of Land
MPP_C	Marginal Physical Productivity of Cow
MPP_L	Marginal Physical Productivity of Labor
MT	Metric Tons
OLS	Ordinary Least Square
OLS	Ordinary Least Square
Rs	Rupees
VDC	Village Development Committee
WB	World Bank

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Nepal is a small, independent, least developed, agricultural country landlocked between two large countries India and China. It has 1, 47,181 square km area. Approximately more than 80 percent of the population lives in rural areas .Agriculture is the main occupation of the people of the rural areas. According to the WB report 2019, agriculture contributes about 31.7% to GDP. Livestock production is an important agricultural sub-sector in Nepal, accounting for approximately 32 percent of agricultural GDP and about 11.5 percent of total GDP (Goletti, Gruhn&Bhatta, 2001). Therefore, commercialization of livestock especially cow farming is crucial for the economic development of our country.

Over 80 percent of the population is involved in agriculture. The seasonal nature of farming leads to widespread underemployment, but programs to grow cash crops and encourage cottage industries have had some success over the years. Two sevenths of the total land is cultivated, of which 1.5 million hectares produced 3.7 million metric tons of the staple crop of rice in 1999. Wheat and maize together take up a similar portion of the available land, with harvests of 1 million metric tons and 1.5 million metric tons, respectively, in 1999. Production of cash crops increased substantially in the 1970s, and sugarcane, oilseed, tobacco, and potatoes (a staple food in some areas) were the major crops. Agricultural production accounted for about three fourths of total exports in the late 1980s. As noted earlier, most exports consist of primary agricultural produce which goes to India. In general the majority of Nepalese farmers are subsistence farmers and do not export surplus; this does not prevent a minority in the fertile southern Terai region from being able to do so. Most of the country is mountainous, and there are pockets of food deficit areas. The difficulties of transportation make it far easier to export across the border to India than to transport surplus to remote mountain regions within Nepal. A considerable livestock population of cattle, goats, and poultry exists, but the quality is poor and produces insufficient food for local needs (CBS, 2012).

Agriculture and cow farming play a great role in the industrialization of countries as a sector producing wealth. On the other hand, the fast increase in the world population constantly keeps hunger and poor nutrition issues in the agenda. It is estimated that the population of the world will exceed 9 billion by 2050s (Oguz and Bayramoglu, 2015). Today, many countries have to be concerned about how to feed their own populations. When considered in this respect, productivity is the driving force of development. Developed countries ensure the stability in their countries with the help of agriculture and animal husbandry sectors, and have their places as exporters in the world arena. When some countries in the world are considered in terms of milk export rates, New Zealand alone covers 25% of the milk need of the world countries, Australia covers 13% of this need; and the USA produces 7% of the milk that is exported all over the world. For this reason, improving animal husbandry is gaining more importance with each passing day (BAKA, 2011).

Cow farming is not a new concept and traditionally the cows were reared at homes in small scale mainly for the production of milk to meet the requirement of the family. The study by Golethi,et al., (2001) showed that 819,000 cows were reared domestically during the latter half of the 1990s in Nepal which produced about 298,000 tons of milk annually. This accounted for the 30 percent of the total milk production in Nepal back then. If we look from a global perspective, commercial cow farming is an established business. Many large and privately owned farms rear cows and produce milk to meet the requirement of the town dwellers, especially in the developed countries. However, the scenario of Nepal is rather different and Nepalese economy is still largely subsistence economy (World Bank). Therefore,, commercial farming is a new concept here in Nepal.

According to statistics from the Ministry of Livestock Development, there are 7.2 million head of cattle and 5.4 million head of buffalo in Nepal. In 2016, 3,000 dairy farms and 424 buffalo farms were registered. Around half of the number of dairy farms are really small, and have around five to ten animals per farm. A small amount has more than 20 animals and only ten farms have 100-500 cattle. The country produces 1.9 million liters milk per day, whereas the demand is 2.4 million liters. The country is therefore importing milk from India. At the same time, most of the (raw) milk is consumed by farmers and doesn’t reach the market.

The role of productivity is extremely important in increasing the national welfare. No matter if a country is developed or a developing one, the basic source of economic development is the productivity arch. One of the most important issues emphasized by economy, which is the science targeting the use scarce resources in an efficient and intense manner are the productivity. The only way to use the existing resources in an efficient way and develop a society is increasing productivity. In this context, productivity may be defined as the relation between the outcomes produced by a production or service system and the inputs used to create these outcomes. In our present day, the developments in agricultural field are in the very heart of the social and economic welfare level of the developed countries.

Nepal is a land where animals outnumber humans and livestock an integral part of the way of life. Only 5% of the cattle in Nepal are considered pure breeds, like Holstein and Jersey. Farmers therefore use artificial insemination (AI) to mix Holstein and Jersey cattle with their local cattle. The idea to cross-breed with high producing breeds such as Holstein is to boost production of local breeds. However, Nepalese farmers often only reach between 500 to 2,000 liters per cow per year. Therefore, productivity is also not very high. It is necessary that animal production is increased in order to cover the demand for food stuffs of animal origin. This is only possible by increasing the productivity per animal. It is inevitable to increase the productivity per animal by improving the animal husbandry and nutrition conditions. For this reason the aim of this study is to increase the competitive capacity of the enterprises by conducting the productivity analysis of the milk enterprises and encouraging the owners for effective trainings in Chandragiri Municipality of Kathmandu Valley.

1.2 Statement of the problem

Nepal is an agricultural country. Cow farming is taken as one of the major cash farming; in order of cow milk and milk product generate the income. Being a profitable occupation than other traditional occupations, cow farming has better prospect for farmers. There is the emergence of private companies and their increasing investment in agricultural sector, especially cow farming. Because the private sector has shown interest, we can deduce with almost certainty that cow farming is a profitable business, especially if we can handle the management effectively.

Nepal has high demand of milk production than the supply made by the Nepali farmers. So, by increase in the cow farming there may be decrease in the import of milk products from abroad. Moreover, FAO(2010) reports that 20 countries from Asia, Europe, Australia and North America compete with Nepalese firms in the market of dairy products like milk, cheese, butter, sweets, and so on. This also strongly suggests that the commercial dairy farming is a profitable business in case of Nepal. There exists a huge room for the prospective entrepreneurs to invest and make a goods income. Therefore, it is vital to learn the cow farming process and its productivity analysis in detail which is the main objective of this study.

This study is also helpful in seeking the answers of the following research questions:

i. What is the status of cow farming in Chandragiri municipality of Kathmandu Valley?
ii. What is the productivity of cow farming in Chandragiri municipality of Kathmandu Valley?
iii. What are the basic problems of cow farming in Chandragiri municipality?

1.3 Objectives of the Study

The general objective of this study is to perform the productivity analysis of cow farming in Chandragiri municipality of Kathmandu Valley. And the specific objectives of this study are:

i. To analyze the status of cow farming in the study area.
ii. To analyze the productivity of cow farming.
iii. To identify the basic problems of cow farming in the study area.

1.4 Significance of the Study

Cow farming in Nepal is an ancient farming system still practiced traditionally all over Nepal. Cow farming is a source of generating income of Nepali. Nepal is an agricultural country there are lots of possibilities in cow or dairy farming. Demands of grass feed dairy products are increasing rapidly in the world, if we export dairy products than we can earn billions of rupees each year. Thus, the main significance of this study is to analyze the productivity of cow farming in the study area.

Other additional significance of this study is that it may be helpful to find out and to solve the problems arises in the commercialized cow farming in Chandragiri municipality of Kathmandu Valley. This study is also vital to show the prospects of cow farming in Chandragiri municipality of Kathmandu. It is also helpful to those farmers who are interested to know about the cow farming in Kathmandu Valley.

1.5 Limitations of the Study

Every study has some limitations according to the geographical structure, environment, social status, thinking of local public etc. of the study area. Such as, the study held on Chandragiri municipality of Kathmandu valley. So, it may be or may not represent the extent of the problems for the country as a whole. The study is related only with productivity analysis of cow farming of the study area. The main limitation of the study are time period as well as finance, due to which large sample may not be included in study. Productivity of cow farming depends upon various factors but this study only includes labor, land and cow which is another main limitation of this study.

1.6 Organization of the Study

This study has been divided into five chapters. The first chapter is introduction of the study dealing with the background of the study, statement of the study, objectives, significance and limitations of the study. Likewise the second chapter is review of the literature in which international and national context have been reviewed. The third chapter of this study includes research methodology in which research design, nature and source of data, method of data collection, model specifications, their features and properties have been elaborated. And mainly the methods and tools of data analysis have been described. In the chapter four, the collected data from the study area and secondary data from different sites, journals, books, reports etc. have been presented and analyzed. The chapter five which is the last chapter of this study; have been presented summary of the findings, conclusions on the basis of findings of the study and recommendations.

CHAPTER 2

REVIEW OF LITERATURE

Livestock farming is an important component of Nepalese economy and cow farming is one of the major components of livestock farming for milk production. Commercial milk production is directly related to the dairy farming. Many researchers have been done in the field of cow farming as well as buffalo farming and milk production or dairy sectors. Among them, some literatures are reviewed here.

2.1 International Context

Swanepoel **(**2014**)** stated that the objective of the research was to quantify the economic contribution of the Colorado dairy industry .Four separate sectors within the Colorado dairy industry i.e. dairy producers, fluid milk and butter manufacturers, cheese manufacturers, ice-cream and frozen dessert manufacturers were analyzed by using I-O models. After estimating the economic contribution of each sector alone, the four individual components were aggregated into one industry. The primary result generated from the IMPLAN estimation was the total output from each of the four industries; $ 593,525,904, $1,601,698,242, $766,750,610, $61,544,628 respectively. This results in a combined economic contribution of over $ 3 billion to the Colorado regional economy. Dairy producer industry crated a total of 2,270 jobs in the economy, fluid milk and butter manufacturing 1,140, cheese manufacturing 773 and ice-cream and frozen dessert manufacturing created a total of 150 jobs in the regional economy. The total dairy industry combined to provide 4,333 jobs in the Colorado economy.

R.BrasZootecnia (2020) analyzed the efficiency of farmers in the dairy production using cross sectional data collected from 92 sample dairy farmers in the West Mediterranean Region of Turkey. The study used the Stochastic Frontier Analysis (SFA) to measure the technical efficiency of farmers in milk production. The technical efficiency of the sample of dairy farms ranged from 0.30 to 1.00. The mean efficiency of the sample of farmers was 0.55, indicating the presence of substantial scope for improving the competitiveness of dairy sector in the region by improving the efficiency of farmers. While some of these variations could be attributable to

random factors, the study calculated that 97.3 percentage of the variations were attributable to the inefficient use of inputs, leaving only 2.7 percentage to random factors. This shows the possibility of increasing average output by about 0.45 without the use of additional inputs. The most significant factors affecting the efficiency of dairy production were household size, total number of cattle, and ratio of the total number of dairy cows to total number of cattle, technological level, barn type, and production of maize silage. This study, by measuring the levels of efficiency and by identifying factors explaining the differences in efficiency, gives useful information for designing policy interventions targeting to improve the competitiveness of the Turkish dairy sector.

Quddus, Md. Abdul &Rahman, K.M. Mostafizur& Islam, Mohammad Amirul (2010**)** investigated the productivity and resource use efficiency of milk production of small scale dairy farmers in Bangladesh. A total of 280 cattle farmers were interviewed in five different districts of Bangladesh. The selection of sample was done using stratified random sampling technique. Apart from descriptive analyses, two types of models such as Cobb-Douglas type stochastic frontier production function and conventional average Cobb-Douglas type income function was estimated. Milk production of crossbreed was found significantly higher than that of indigenous cow. Farmer's education was positively associated with technical efficiency in milk production. Some important predictors of household income were identified. Analyses further suggested that milk production of local breed and crossbred cow can be increased by 41 percentage and 40 percentage, respectively by increasing the farmer's technical efficiency with the same resource base and technologies. The study recommended that all the livestock farmers should be given training on technical aspects of milk production and livestock health with a view to increasing milk production.

Oguz and Yener (2018)analyzed the productivity of dairy cattle farms in Turkey. The aim of this study is to increase the competitive capacity of the enterprises by conducting the productivity analysis of the milk enterprises in Konya province. Çumra, Karapınar and Ereğli districts constituted 15 percentage of the number of bovine animals, were selected by using purpose sampling method. The number of dairy cattle in these enterprises constituted the main frame of the population the

primary data collected from 125 dairy farm enterprises with questionnaire technique through stratified sampling method with 95 percent confidence interval and error margin of 5 percent. These enterprises were separated groups according to the number of animals as 0-50, 51-150, and 151-+ groups.It was studied with totally 125 sample farms; 72 in the first group, 38 in the second group and 15 in the third group. It was calculated that the average gross production value was 234,017.90 $, variable costs were 127,370.25 $, gross margin was106, 647.65 $ and fixed costs were 52,820.19 $. Net agricultural income was calculated as 66,309.04 $ and 1 Kg raw milk cost is 0.27 $ at the surveyed. Generally, the productivity increases based on proportional enterprise scale. At these enterprises, labor productivity was156.97$, capital productivity was 0.28, variable inputs productivity 1.84 and cattle unit productivity was 2,827.47 $. The technical efficiency of the enterprises was calculated as 0.927, the scale efficiency was 0.973. As a result, it was determined that 44 enterprises were effective, 81 enterprises were ineffective within 125 dairy farming.

Aktürk et al., (2010) conducted in Biga District of Çanakkale Province, it has been aimed to examine the relations between the milk production and factors used in milk Production. Keskin and Dellal (2011), have conducted a study for estimating the gross margin in dairy cattle breeding in the Thrace Region of Turkey. According to the results of the study, it has been determined that, in the farms there were 5.5 suckling cows and 10 Large Animal Unit (LAU) in the average. The milk production was 32 tons per farm and 5.8 tons per Suckling cow during lactation period.

Felipe (2005) performed a compressive study on Cobb-Douglas production model and concluded that the model has very serious implications for today's work in macroeconomics. An algebraic transformation of the identity, under the appropriate assumptions about the data, yields a form that resembles a production function. This implies that if the correct form of the identity, written as a production function, were fitted, one should always conclude that the aggregate production function exhibits constant returns to scale, and that factor markets are competitive. Every firm is a profit maximize and is very much concerned about the theory of firm in order to make correct decisions regarding what items, how much and how to produce them. All these decisions are directly related with the cost considerations and market situations where the firm is to be operated.

FAO (1972) has mentioned milk as the only farm product which can provide a day to day income, but it must be collected every day, except perhaps during the dry season. The farmer should be encouraged to produce milk and to become milk minded by providing a market for his production. A farmer will become accustomed to receiving a certain amount of cash everyday once he possesses money, the milk producer will certainly look for means spending it to improve his standard of living. Thus, encouraging a local trade for various commodities for his family or foods and daily equipment. When a number of farmers in the same village are doing the same thing, this will have considerable impact on the social and economic development of the community as a whole. This has been shown on many occasions where the opening of a milk plant with regular daily collection and payment has improved the standard of living not only of the farmers but also of other people living in the area.

Bell, Wall, Russell, Simmamd Stott(2011)compared the environmental impact of a range of dairy production systems in terms of their global warming potential(GWP) and associated land use, and explored the efficacy of reducing said impact. Models were developed using the unique data generated from a long-term genetic line × feeding system experiment. Holstein-Friesian cows were selected to represent the UK average for milk fat plus protein production or were selected for increased milk fat plus protein production. In addition, cows received a low forage diet (50% forage) with no grazing or were on a high forage (75% forage) diet with summer grazing. A Markov chain approach was used to describe the herd structure and help estimate the GWP per year and land required per cow for the 4 alternative systems and the herd average using a partial life cycle assessment. The CO_2-eq. emissions were expressed per kilogram of energy-corrected milk (ECM) and per hectare of land use, as well as land required per kilogram of ECM. The effects of a phenotypic and genetic standard deviation unit improvement on herd feed utilization efficiency, ECM yield, calving interval length, and incidence of involuntary culling were assessed. The low forage (no grazing) feeding system with select cows produced the lowest CO_2-eq. emissions of 1.1 kg/kg of ECM and land use of 0.65 m^2/kg of ECM but the highest CO_2-eq. emissions of 16.1 t/ha of the production systems studied. Within the herd, an improvement of 1 standard deviation in feed utilization efficiency was the only trait of those studied that would significantly reduce the reliance of the farming system on bought-in synthetic fertilizer and concentrate feed, as well as reduce the average CO_2-

eq. emissions and land use of the herd (both by about 6.5%, of which about 4% would be achievable through selective breeding). Within production systems, reductions in CO_2-eq. emissions per kilogram of ECM and CO_2-eq. emissions per hectare were also achievable by an improvement in feed utilization. This study allowed development of models that harness the biological trait variation in the animal to improve the environmental impact of the farming system. Genetic selection for efficient feed use for milk production according to feeding system can bring about reductions in system nutrient requirements, CO_2-eq. emissions, and land use per unit product.

Rob, Topader and Islam (2010) have conducted a study on Comparative study on the cost benefit between indigenous and cross bred cows reared in rural area of Dinajpur district in Bangladesh. In their study a total of 70 dairy cows (20 crossbred and 50 indigenous) from rural level small and marginal dairy farmers (1-3 cows) have been selected. Relevant information from the individual milk producers have been collected through personal interrogation method with the help of a structured data collection questionnaire prepared for the study. According to this study the cost involvement for feed, treatment and medication of crossbred cows were significantly higher ($P<0.01$) than the indigenous dairy cows. They found that the per day milk production was 1.86±0.57 liter in indigenous cow whereas 5.94±3.49 liter was in crossbreeds cows and income level form the milk yields of crossbred cows were 3.19 times higher than the indigenous cows. The cost benefit ratio of rising crossbred and indigenous dairy cows were 1.19 and 1.26, respectively. According to their study the current rearing cost of crossbred cows was 2.71 times higher than indigenous cows. By considering the other traits they concluded that the raising of crossbred cows was more economic than the raising of indigenous cows. Consequently they conclude that the inclusion of a few crossbred cows can increase the income of a dairy entrepreneur which improve the livelihood and provide round the year employment of its family labor.

Moreira, Bravo-Ureta (2016) measured total factor productivity change and then decomposed this change into several distinct elements. The data were an unbalanced panel for the period from 2005 to 2010 containing 477 farms and 1,426 observations obtained from TODOAGRO, a farm-management center created in 1996 in the southern part of Chile. The region where the data come from accounts for 20% of the

total milk processed in the country. Stochastic production frontiers along with the Trans log functional form were used to analyze total factor productivity change. The econometric evidence indicated that farms exhibit decreasing returns to size implying that costs of production rise as farm size increases, which suggests that the motivation for farm growth stems from the search for income rather than from lowering costs. The main results indicated that productivity gains through TE improvements are limited, with an average TE for the whole sample of 91.0 percent, and average technical efficiency change of 0.05 percent per year. By contrast, average technological progress at the sample mean was rather high at 1.90 percent, which suggests that additional investments in research and subsequent adoption of improved technologies would have a positive effect on productivity growth. The findings also revealed that farm size is not associated with productivity growth for the dairy farms in the sample.

Ashton, Cuevas-Cubria, Leith and Jackson (2014)studied the trends, productivity growth and drivers of productivity growth in the Australian dairy industry by conducting a series of workshops with dairy farmers, consultants, milk processors and representatives from various state departments responsible for agriculture. The study found out that the structure of the Australian dairy industry has changed markedly over the past 30 years, driven by a range of factors such as the removal of government support and regulated milk prices, changing world dairy product markets, and prolonged drought. During this period, the number of dairy farms in Australia has fallen by nearly two-thirds, the total area used for dairying has halved, and the milk product processing and distribution sectors have been significantly rationalized. Despite fewer resources being used for milk production, this restructuring has promoted a more efficient industry and has enabled growth to occur in the gross value of Australian dairy production per farm in real terms. Over the period since 1978–79, there have been large variations in farm business profit for Australian dairy farmers, particularly since the early 2000s when farm gate milk prices became more closely aligned with volatile world dairy product prices. Over the same period, drought has adversely affected profits in some years by lowering milk production and increasing farm input expenditure, particularly on fodder. Despite the wide movements observed in average farm business profit, the long term trend for the Australian dairy industry in real terms (inflation adjusted) has been slightly upward over the period from 1978–

79 to 2010–11. This suggests that productivity gains have enabled the dairy industry on average to maintain or improve profitability over the longer term despite falling terms of trade.

Girma (2019) estimated technical efficiency in milk production of dairy farmers in central zone of Tigray National Regional State using stochastic frontier production function approach. Cross-sectional data collected from 163 dairy farmer households was used in the analysis. The result showed that the average technical efficiency of sampled dairy farmer households was about 63.7 percent. It also showed that labor input by households and average amount of daily cost of crop residue/byproduct did not influence amount of milk produced when stochastic frontier and inefficiency effects are estimated in combination. The estimates of coefficients of other explanatory variables of stochastic frontier production function (i.e. number of lactating cows, average daily cost of purchased supplements, average daily health/veterinary expenditure and average amount of water consumed daily) were found to influence amount of milk produced positively. From the explanatory variables incorporated in inefficiency model sex of household head, extension contact and households off farm income did not influence inefficiency of dairy farmer households while age of household head, years of education of the household head and cattle size were found to influence inefficiency of dairy farmer households negatively. Age squared of household head and household sizes influenced inefficiency of dairy farmer households positively. Thus, it can be concluded that by improving dairy farmers' access to education, family planning program and improving bureaucratic environment in providing extension services it is possible to increase amount of milk produced.

2.2 National Context

Acharya (2012) has analyzed the livestock farming and cost of buffalo milk production in Ugratara VDC of Kavrepalanchowk district. The general objectives of this research were to study the livestock farming trends in Nepal, to identify per unit (Per liter) cost of milk production of buffaloes according to size of stall, to compare the cost of milk production and price of milk paid by DDC. From this study, researcher found that per day per milking buffalo average total cost were Rs. 32.80 , Rs. 31.20 and Rs. 29.40 for one, two and three buffalo stalls respectively. And so the

single buffalo stall has higher total cost than other big stalls. Therefore, farmers should keep more than one buffalo for milk production to get more profit. Among the cost component feed cost constituted to be the most significant component cost. It varied from Rs. 120.33 for one buffalo stall, 103.18 for two buffalo stall and 92.65 for three buffalo stall respectively. Labor cost varied from Rs 60.50, Rs. 44.25 and Rs. 46.83 for one buffalo stall, two buffalo stall and three buffalo stalls respectively. The labor cost also decreasing when the number of buffalos in stalls was increased.

Timalsina (2010)studied the economics of dairy farming in Phulbari village of Chitwan district. It showed that the average daily milk production of buffalo and cow was highest among large farm size category followed by small and medium ones. The highest average daily milk yield in large category was due to large number of improved breed and milch cows. Lower milk price was found in large category due to its low fat and SNF content in comparison to other categories. Thus, the cost of milk production was negatively related with farm size. The cost of milk production of small farm size category was 25 percent higher than large farm size category. The sum of the two elasticity coefficients of labor and capital was found 1.483 suggesting that perhaps the milk production in different farm categories was characterized by increasing returns to scale. Benefit-cost ratio of large category was highest (1.42) followed by medium (1.33) and small (1.23) farm size categories. The significant difference in gross margins among the farm categories notwithstanding the dairy business has been a profitable and contributed significantly in the household economy.

Shrestha (2016)analyzed the productivity of cow farming in Putalibazar municipality. This research was mainly based on the primary data. However, secondary data was also included as it required. To meet the targeted objectives of this study, structured as well as unstructured questionnaire had been used. Collected data had been analyzed in Microsoft Excel and they were interpreted by using the simple linear production function and Cob-Douglas production function. The study found out that the share of cow milk in milk production is lower than that of buffalo's share as the share of cow milk in total milk production was found to be just 33.41 percent in the context of Nepal. Similarly in the case of Syangja, it was found to be 14.59 percent in fiscal year 2014/15 but it is in increasing trend. And it is seen that the local cattle has the vital

role in the cow farming as the negligible number of improved cattle were in cow farming in Syangja. In context of Putalibazar at the 56 time of this study, from 27 different cow farms, out of 140 cattle there were 30 male and 110 female cattle. And there were 92 local cattle and 48 improved. According to the findings of this study, 67 milking cattle out of 92 local cattle contribute 39.84 percent of total milk production per day. While it was 60.16 percent for 43 milking cattle out of 48 improved cattle. The result obtained from the ordinary least square estimation in fitted production models like Simple Linear and Cob-Douglas Production function, showed that the value of parameters obtained in both models supports the economic theory. The findings with the marginal physical productivity of labor and capital from the simple linear model gives the conclusion that the labor is more effective than the capital at cow farming in Putalibazar. This is again supported by the findings of Cob-Doulas production function which reveals that the output elasticity of labor is greater than that of the capital. And with the addition of two output elasticity's giving the result greater than unity, concludes that the production function of cow farming is characterized by increasing returns to scale.

Paneru, Sharma, Kolachhapati and Shrestha(2015) studied the productive performance of dairy cattle in major milk pocket area of Chitwan and Nawalparasi districts. The study also aimed at categorizing the breed based on its breeding value to determine the most elite cow of different breed. Four years of data obtained from Animal Breeding Division in the period between (2008- 2012) under the Dairy Cattle Improvement Program were reviewed and analyzed. Altogether, 18316 test day records of 728 animals of 172 herds were considered for evaluation. Results of the above study revealed that the overall least square mean and standard errors (LS mean and SE) of Lactation Milk Yield (LMY), fat percentage, and protein percentage were 2841±84.95 kg, 4.43±0.66 % and 3.33±0.1 %, respectively. Moreover, the study also revealed that breed had significant effect on milk yield ($p< 0.01$) and Fat percentage ($p< 0.001$). In addition, top dairy cattle are ranked based on its breeding value on productive parameters. Results of the above study suggested that animal of higher breeding value and its offspring need to be promoted for better productivity in farmer managed condition of Nepal.

Karna (2016) investigated to analyze the determinants of milk production of dairy firms in Rupandehi district of Nepal with the objectives to examine the factors that affect marketed surplus of milk production in the study area. The survey was carried out for the milk farmers by collecting information from 100 sampled dairy farmers in five selected villages of the district. Descriptive statistics and least square regression technique were applied for the purpose of analysis The major determinants; total number of cattle (β=1.034), labor hours (β=0.381 ml), green fodder (β=67 ml/kg), amount concentrate fed (β=1.232 liter/kg), cost of veterinary service (β=5.12 ml), pasture land (β=0.988 liter), Area of animal Shed (β=0.004 ml/square feet), access to credit (β=0.034 ml), member of milk cooperative (β=609 ml) and multiple source of income (β=1.065 liter) are positively related with the level of milk yield. The determinants; age of farmer (β=46 ml/year), sex of farmer (β=1.473 for male), family size (β=223 ml), amount of dry fodder (β=30 ml/kg), level of education (β=104 ml/grade), Year of dairy experience (β=37 ml/year), cattle insurance (β=336 ml), Visit of veterinary staff (β=957 ml), dairy training (β=86 ml) and facility of insemination (β=301 ml) are negatively related with the level of milk yield identified under the study.

2.3 Research Gap

Different studies have been done in the national and international level regarding to cow farming. Especially, the productivity analysis of cow farming in Chandragiri municipality is the first research based on current data. It is found that, there are a lot of researches have been done on dairy farming in the context of Nepal as well as in Kathmandu but no one yet studied on the productivity analysis of cow farming. So, this research may help to reduce the gap between national and international context about the productivity analysis of cow farming.

CHAPTER 3

RESEARCH METHODOLOGY

Research methodology is an essential part of the thesis paper which forms the framework for obtaining all necessary inputs of the study. It refers to the various steps to be adopted by researchers in studying the problem with certain objectives in view. In this study the methodology includes research design, nature and sources of data, sampling procedure, data collection techniques and tools, data processing, analyzing methods and presentation.

3.1 Research Design

The study is designed in accordance with the given objectives of the study. It is based on the primary data of milk production as dependent factor. Actually, milk production depends upon a number of variables and invisible factors. But, the study covers only three essential inputs like labor, land and cow as independent factors.

3.2 The Population, Sample and Sampling Procedure

There are about 6000 cows and buffaloes in the registered and unregistered cow farms in this municipality. The number of registered cow farms are 29 in 15 different wards of this municipality, whereas there are large number of unregistered farms as compared to registered farms. So to make the study more reliable, those farmers have also been included in the study that had lesser number of cattle in their farm. For this study, 24 households i.e. cow farming households have been selected for interview. Out of 24 cow farms, 12 farms are registered farms whereas 12 farms are small and unregistered farms. So, before the field survey, a list of total household in different area of municipality was prepared. Then, the required sample household was found by using lottery sampling method of the 15 different wards of the municipality.

3.3 Nature, Source and Instruments of Data Collection

This study is mainly based on primary data and depends on secondary data whenever required. Primary data has been collected from study area by using structured and unstructured questionnaires, Field survey. Here interview schedules i.e. structured

questionnaires has been used to collect primary data and relevant information. A set of structured questionnaire has been developed for the interview and these questions have been asked to the head of household or a responsible member of the cow farm. The questionnaire was especially designed to cover all the required data and information of the study. All the secondary data have been collected from different published and unpublished records, text books and previous research studies, reports of government and non-government organizations.

3.4 Data Processing and Analysis Technique

After having interview, the collected data and information were organized in a systematic order for the data analysis. In the study, both descriptive and analytical methods were used for the presentation of collected data and information. The different types of economic and statistical tools are used for data analysis and interpretation like simple linear production function, Cobb-Douglas production function, and R-square test.

3.5 Specification of the Variables

The general form of the production function is Y= f (L, La, C) where, 'Y' denotes the milk production as a dependent variable, 'f' denotes the functional relationship between dependent and independent variables, Similarly, L, La and C denote labor, land and cow respectively as explanatory variables.

3.5.1 Milk(Y)

Production of the milk is taken as a dependent variable. It is measured in physical units 'liter'.

3.5.2 Labor (L)

Labor is taken as a major input of production. It is used on the basis of use of total men in every step of milk productive activities.

3.5.3 Land (La)

Land is taken as an input of production. It is taken on the basis of total ropani of land used for cow farming.

3.5.4 Cow (C)

It is taken on the basis of total number of cows in the farm.

3.6 Specifications of the Model

There are various forms of production function that can represent the input output relations in econometric models. This study uses only two modes of production function namely Simple Linear and Cobb-Douglas production function. The general relation is Y=f (f (L, La, C) where, 'Y' denotes the milk production as a dependent variable, 'f' denotes the functional relationship between dependent and independent variables, Similarly, L, La and C denote labor, land and cow respectively as explanatory variables.

The two production function model that has been used for this has been discussed shortly below.

3.6.1 Linear Production Function

The linear production function model can be in the form of simple linear equation

$Y= A+ \alpha L+ \beta La+ \theta C$ where, Y denotes the milk production, L, La and C denote labor, land and cow respectively. A (constant), α (share of labor contribution), β (share of land contribution), θ (share of cow) are the parameters which are estimated from empirical data.

3.6.2 The Cobb-Douglas Production Function

Cobb-Douglas production function is one of the widely used production function used in the economics. C.W Cobb and H. Douglas formulated this function in 1928. They formulated this production function with the ideal assumption that the sum of the elasticity's should be equal to one. The strong view that the sum of the elasticity's

should be one has been dropped out with the criticism of Durand and a new function as “Power function” came into existence, which is linear in logarithmic form.

The simplest Cobb-Douglas production function model has the following form:

$Y=A\ L^{\alpha}\ La^{\beta}\ C^{\theta}$, Where, Y stands for milk production, L for labor, La for land, C for cow. The parameters A, α, β are estimated from empirical data. Where $0<\alpha<1$, $0<\beta<1$, $0<\theta<1$ .Equivalent is a linear function of the logarithms of the five variables:

$\text{Log}(Y) = \log(A) + \alpha \log(L) + \beta \log(La) + \theta \log(C) + u$; where residual u is added in the multiplicative form e^{u}.

3.7 Methods and Tools of Data Analysis

Data has been collected from the study area through questionnaire method, interview method and field survey for primary data. Journals, published and unpublished research and reports have been used for the secondary data. Collected data has been grouped, sub-grouped and classified as necessary so as to meet the objectives of the study.

Regression, t-test, Simple linear production function and Cobb-Douglas production function has been used to analyze the productivity of the cow farming. The systematic analysis has been made by sing qualitative technique. Besides these, table and charts have also been used for the presentation of the findings.

This study used the ordinary linear square (OLS) in log linear regression analysis. So, simple linear and C-D production models have been used. Following are the major factors, which the analysis will be looking at, despite the properties of production functions already discussed above.

3.7.1 Coefficient of Determinant (R-square)

The coefficient of determination (R^2) is defined as the square of the coefficient of multiple correlations. When it is multiplied by 100, it gives the percentage of variance in dependent variable which is associated with the variance in independent variables. The range of it is in between -1 to 1. If the value is close to 1 it shows positive

relationship and imply that more of the variability in dependent variable is explained by the regression model. Therefore, it is very necessary statistic to compute for determination of validity of regression model. The sample coefficient of determination is given by: $R^2 = \frac{ESS}{TSS} = 1-\frac{RSS}{TSS}$; Where, ESS= Estimated sum of square, RSS= Residual sum of square, TSS= Total sum of square.

3.7.2 Standard Error of Estimates

Standard error of estimates, also called as the Standard Error of Regression (SE) is simply the standard deviation of Y values about the estimated regression line and is often used as a summery measure of the "goodness of fit" of the estimated regression line. The standard error of estimate is given by:

$S_{reg} = \sqrt{\frac{ut\hat{}2}{n-3}}$, Where, $ut^2 = \Sigma (Y\ t - \hat{Y}\ t)^2$

3.7.3 Microsoft Office Excel

The econometric tool used for the data analysis in this study is Microsoft Office Excel. Microsoft Office Excel 2007 has been used for this study. Microsoft Office Excel is ideal package for quickly and effectively managing data, performing econometric and statistical analysis, generating forecast or model simulation and producing high quality graphs and tables for publication or inclusion in other applications and simply, it is very fast and easy to use than any other econometric software. Here in this study is used mainly for econometric analysis.

CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

This chapter four consists of presentation and analysis of data relating to the output (Y) and three inputs as the explanatory variables, Labor (L), Land (La) and Cow (C). This is the main text of the study to find out the answer of research question and satisfies the objectives of the study. For the purpose of presentation and analysis, 24 different farm's data has been analyzed. The collected and tabulated data have been analyzed by using Microsoft Office Excel 2007. This chapter includes presentation, analysis and integration of collected data with organizing sequentially as per the objectives of the study.

4.1 Introduction of the Study Area

Chandragiri Municipality situated in south-west part of Kathmandu valley in Province 3. The total area of the municipality is 43.92 Sq.km. Chandragiri Municipality was declared on 2 December 2014 merging eleven VDCs, PuranoNaikapBhanjyang, NayaNaikap, Thankot, Mahadevsthan, Matatirtha, Machhegaun, Balambu, Dahachowk, Tinthana, Satungal of Kathmandu. Chandragiri municipality has been divided into 15 wards for the efficient administration. Chandragiri Municipality is surrounded by Kritipur Municipality in the east, Dhunibeshi Municipality in the West, Nagarjun Municipality in the North and Dakshinkali Municipality in the south.Prithivi Highway passes through center of Chandragiri municipality connecting Kathmandu with other part of Nepal.

There are 3 major rivers in Chandragiri Municipality. The major rivers flowing through the municipality are Balkhukhola, DaudaliKhola and GhatteKhola. These rivers are perennial rivers. The BalkhuRiver flows through wards 1, 2, 4, 12, 14, and 15. Ghattekhola flows through wards 8, 10 and 15 and DaudaliKhola flows though wards 12, 13, 14 and 15. There are 176 community forest in Kathmandu district among them 23 community forest lies in Chandragiri municipality which covers 1170.78 ha. The total population of the municipality as per the census 2068 B.S. is 85,198 with male population 42,881 and female population 42,317, municipality holds 3.38 percent population of Kathmandu valley. The total population of

Kathmandu valley in 2068 is 2,517,023 (CBS 2068). From 2058 B.S to 2068 B.S, total population of Chandragiri Municipality increased from 55,032 to 85,198 at population growth rate of 4.44 percent.

This municipality is endeavoring to drive its development process through tourism, agriculture and industrial development. There are immense explored and unexplored archaeological and historical heritage sites which can really attract tourist local as well as international provided it is properly disseminated nationally and internationally. This economy at present is based on industry and trade. Chandragiri has lots of historical, archaeological and religious sites which can attract many local and international tourists. The recently constructed cable car has attracted lots of domestic tourists in this municipality every day and the number of visitors is more than double during holidays. There are about 45 industries and the major industries are Frooti, hume pipes production, Samsung's assembly plant, Sipradi Trading etc. According to 2070/71 data, there are about 6000 cows and buffaloes in this municipality. There are altogether 20 farms with more than 10 livestock's. Similarly, farm with livestock number 10 to 50 is 10.

4.2 Status of Cow Farming

Cow farming in Nepal is an ancient farming system. And it is still practiced traditionally all over the Nepal. Commercial cow farming in Nepal is recently introduced and becoming popular between farmers but still it is in infant stage. Cow farming is mainly based for milk production although still the buffalos are preferred for milk production in Nepal.

4.2.1 Milk Production in Nepal

Table 4.1 shows the status of milking cows and buffalos are given where the number and the quantity of produced milk of cow and buffalo are shown.

Table 4.1: Number of Milking Cows, Buffalos and the Production of Milk in Nepal

Years	Cow		Buffalo		Total milk Production(MT)
	Numbers of Milking Cows	Milk Production(MT)	Number of Milking Buffalos	Milk Production (MT)	
2015\16	1,026,135 (0.018)	643,806 (9.54)	1,355,384 (0.76)	1,210,441 (3.63)	1,854247 (5.61)
2016\17	1,029,529 (0.33)	665,285 (3.34)	1,509,512 (11.37)	1,245,954 (2.93)	1911239 (3.07)
2017\18	1,039,538 (0.97)	754,126 (13.35)	1,535,948 (1.75)	1,338,277 (7.41)	2092403 (9.48)
2018\19	1,078,775 (3.77)	795,530 (5.49)	1,560,584 (1.60)	1,372,905 (2.59)	2168435 (3.63)

Source: MoALD 2020

(*Note*: Numbers in brackets denote growth in percent as compared to that of previous fiscal year)

It is found that the cows and the buffalos are the main source of milk production in national context. In 2018\19, out of the total population of buffaloes and cows, only 1,560,584 buffalos and 1,078,775 cows are said to be milking and total of 2,168435 MT milk was produced in the country. Of which the share of buffalo milk was 1,372,905 MT i.e. 63.31 percentage and that of the share of the cow milk was 795,530 MT i.e. 36.69 percentage. Total milk output has been increased as compared to the 2017\18.

As compared to 2017\18 the numbers of milking cows has been increased by 3.77 percent and that of milking buffalos has been increased by 1.60 percent in 2018\19. On the other hand, as compared to 2017\18 cow milk production has been increased by 5.49 percent and that of buffalo milk production has been increased by 2.59 percent in 2018\19.

4.2.2 Numbers of Cattle in Nepal

According to the age of cattle, their numbers in Nepal are shown in the table 4.2;

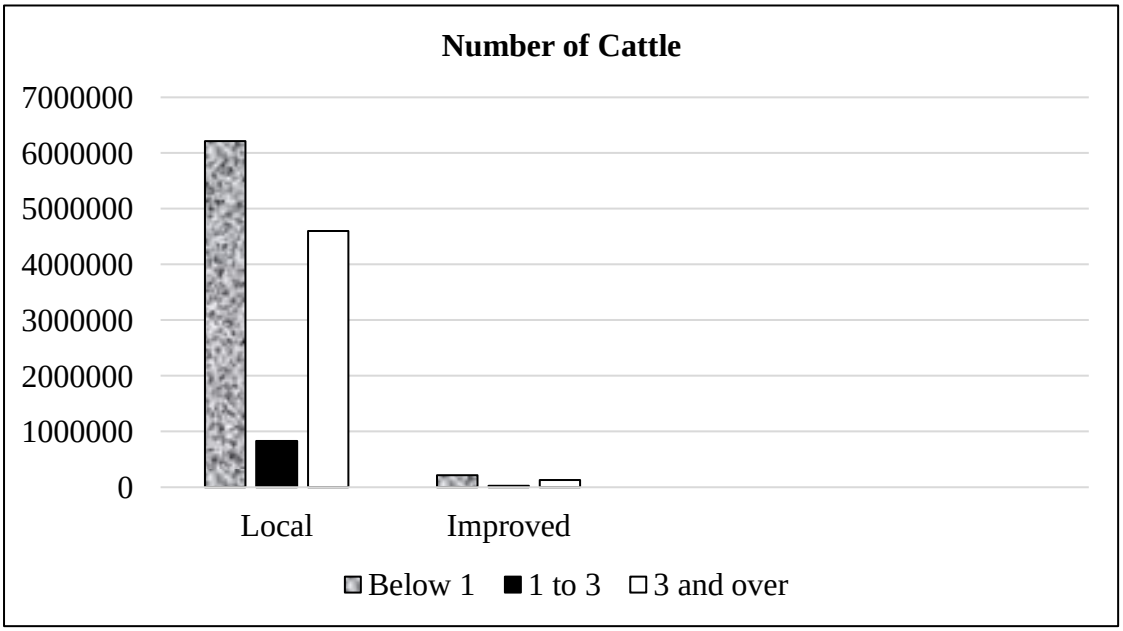
Table 4.2: Number of Cattle in Nepal

Cattle	Below 1 year	1 to 3 years	3 and over years	Total
Local	6214326	835369	4,598,470	11648165
Improved	216071	32024	134,744	382839
Total	6430397	867,393	4,733,214	12031004

Source: Livestock Statistics of Nepal, 2017

The table shows the number of cattle of year 2017. Out of the 12031004 cattle 11648165 are local and 382839 are improved. Total number of cattle that are below 1 year are 6430397. There are 867,393 cattle that are 1 to 3 years. In the same way there are 4,733,214 cattle that are 3 and over.

Figure 4.1: Number of Cattle in Bar Diagram



Source: Central Bureau of Statistics, 2017

According to this figure, it shows the number of cattle of year 2017 in which huge number of cattle are local and that of improved are negligible.

4.2.3 Number of Cattle in Kathmandu District

According to the age of cattle, their numbers in Kathmandu district are shown in the table 4.4;

Table 4.3: Number of Cattle by their Age in Kathmandu District

Cattle	Below 1 year	1 to 3 years	3 and over years	Total
Local	3314	1189	7993	12496
Improved	2732	1088	5767	9587
Total	6046	2277	13760	22083

Source: Livestock statistics of Nepal, 2017

From tale 4.4, we can say that the numbers of improved cattle are negligible. Huge numbers of cattle are of local type. Here in the table above 4.4, below one year cattle are 6046and out of them only 2732 of cattle are improved types and 3314 are local types. Likewise, in the age group of one to three years cattle, there are again only 1088 are improved and 1189 are local. And this is worsen for improved cattle inn age group of three and over, only 9587 out of total cattle are improved and rest of all are local breed that is 12496.

4.2.4 Production of Milk in Kathmandu District

Table 4.4 shows the production of milk in Kathmandu of cow and buffalo from fiscal year 2015\16 to the fiscal year 2018\19.

Table 4.4: Total Milk Production in Kathmandu District

Year	Cow milk production (MT)	Buffalo milk production(MT)	Total milk production (MT)
2015\16	4,166 (27.71%)	10,867 (72.29%)	15,033 (100%)
2016\17	4,261 (27.94%)	10,987 (72.06%)	15,248 (100%)
2017\18	5,056 (30.94%)	11,287 (69.06 %)	16,343 (100%)
2018\19	5,218 (30.53%)	11,872(69.47%)	17,090 (100%)

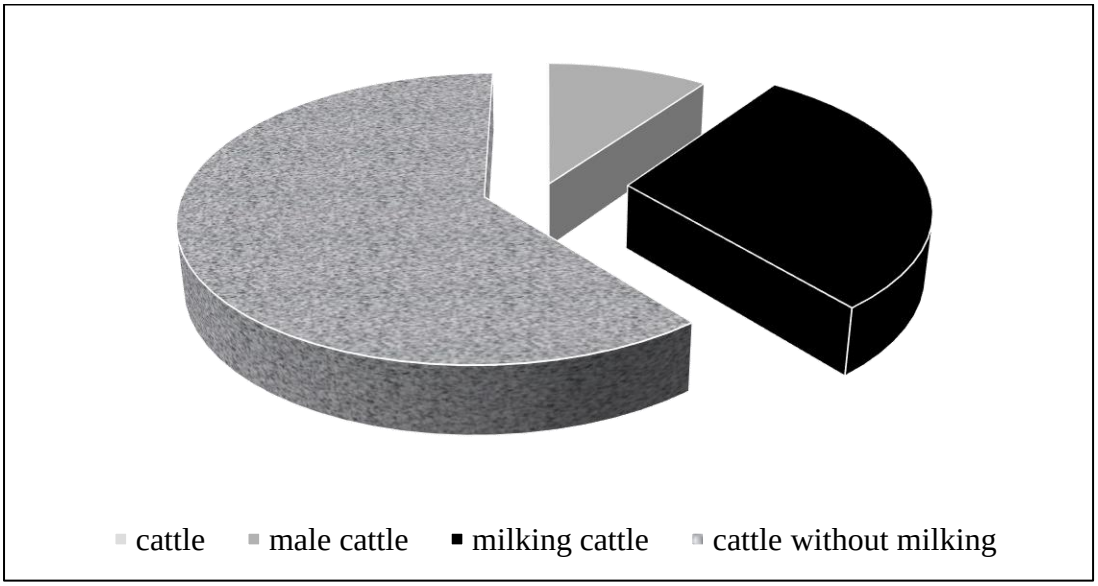
Source: MoALD 2020

According to the table 4.5, in fiscal year 2015\16, out of total milk production, share of cow and buffalo are 27.71 percentage and 72.29 percentage respectively. In fiscal year2016\17, the share of cow milk in total milk production was 27.94 percentage and that of buffalo was 72.06 percentage. The share of cow milk was increasing trend and in fiscal year 2017\18 it became 30.94 percentage from 27.94 percentage. Similarly, in fiscal year 2018\19, the share of cow milk became 30.53 percentage.

4.2.5 Number of Cattle in Dry and Milking Period in Kathmandu District

Figure 4.2 shows three and over years of cattle's number and are divided in male, female cattle of dry period and milking cattle.

Figure 4.2: Number of Cattle in Dry and Milking Period in Kathmandu District



Source: Livestock Statistics of Nepal, 2017

Figure 4.2 shows the number of cattle of three and over years. According to this table there are huge number of cattle without milking i.e. are in dry period are 8372. Out of total female cattle only 4022 are milking cattle and the total numbers of male cattle are 1366.

4.2.6 Production of Milk in Chandragiri

According to the Central Bureau of Statistics 2068, Chandragiri municipality has 85,198 populations in 20,532 household. Out of 20,532 households farmers of 24 households have been involved in study. On the basis of this study, following are the information of milk production in Chandragiri.

Table 4.5: Milk Production in Chandragiri

Local Cow		**Improved Cow**		**Total milk production in Liters**
Out of total milking cows	**Production of milk in liters**	**Out of total milking cows**	**Production of milk in liters**	
119	1105 (67.71%)	32	527 (32.29%)	1632 (100%)

Source: Field Survey, 2021

Out of 181 local cattle, 119 are milking cattle and out of 39 improved cattle, 32 are milking cattle. From these 119 local and 32 improved cattle, 1632 liters of milk are producing per day in Chandragiri. Where the share of local cattle's in total milk production is 67.71 percentage i.e. 1105 liters per day. And that of improved cattle is 32.29 percentage i.e. 527 liters per day.

4.2.7 Number of Cattle in Chandragiri

Table 4.6: Number of Cattle in Chandragiri

Cattle	**Local**	**Improved**	**Total**
Male	30	1	31
Female	151	38	189
Total	181	39	220

Source: Field Survey, 2021

Table 4.6 shows the number of cattle in Chandragiri. Which is the total number of cattle's of 24 cow farms of Chandragiri. Here out of 220 cattle, 181 are local cattle

and rest of other i.e. 39 cattle are of improved. The numbers of male cattle in local cattle are 30 while it is just one in improved cattle.

4.3 Production Function Model Estimation and Productivity Analysis

The OLS regression has been done for Simple Linear Production Function and Cobb-Douglas production function model. And parameters obtained from these models are used to estimate and compare the land, cow and labor productivity. For this observed quantities of different variables are tabulated below:

Table 4.7: Observed Data with Respect to Y, L, La and C of Different Farms

S.N	Milk (Y) in Liter	Labor(L)	Land (La) in ropani	Cow (C)
1	60	4	2	9
2	56	2	2.5	7
3	84	3	4	10
4	124	3	7.2	14
5	66	4	6	11
6	63	4	3	7
7	56	2	3.5	8
8	28	3	2	5
9	115	5	4	12
10	106	4	5	15
11	44	2	2.5	6
12	84	3	4	11
13	107	2	3	4
14	122	4	6	18
15	99	3	4.3	13
16	36	2	2	7
17	26	2	1	4
18	47	3	2.5	5
19	51	3	3	7
20	52	3	3.5	6
21	89	4	4	15
22	50	2	3	9
23	60	3	2	8
24	72	3	3	10
Avg	70.7083	3.0417	3.4583	9.2083

Source: Field Survey, 2021

Table 4.7 is obtained from the data of 24 different cow farms of Chandragiri.

4.3.1 Linear Production Function

This is just a simple linear regression without log in the form of Y= A+ α L+ β La+ θ C. function. The table below shows the output result of OLS regression as Simple Linear Production Function.

Table 4.8: Result of OLS Regression as Simple Linear Production Function

Dependent Variable: Y (Observation-24)				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-values**
L	2.8372	5.4905	0.5167	0.6110
La	9.0785	4.1562	2.1843	0.0410
C	2.7634	1.7957	1.5389	0.1395
R-Square			0.67	
S.E of regression			18.0935	

Source: Computation with Microsoft Office Excel 2007 from table 4.7

This above values can be converted in functional form of simple linear model as;

Y= 5.2354+ 2.8372L+ 9.0785La+ 2.7634C…… (1)

From this equation (1), it is known that the production of cow farm of Chandragiri, for the 24 different observation. The output can be obtained by adding the constant value of 5.2354 to the additional resultant of 2.8372 times the number of labor, 9.0785 times the size of land and 2.7634 times the number of cow.

From the statistical viewpoint, the estimated regression line fits the data very well. The R^2 value is 0.67 that means about 67 percent of variation in output is estimated by the labor, land and cow.

4.3.2 Marginal Physical Productivity for Linear Production Function

It is seen that, marginal physical productivity of labor is

$MPP_L = \frac{\delta Y}{\delta L}$

= 2.8372; meaning that the increase in one labor can increase the output product by 2.8372 Ltrs in a farm.

For the Marginal Physical Productivity of Land;

MPP $_{La}$= $\frac{\delta Y}{\delta La}$

=9.0785; which means that the increase in one ropani of land can increase the output of the farm by 9.0785 Ltrs.

And for the Marginal Physical Productivity of Cow;

MPP $_{C}$= $\frac{\delta Y}{\delta C}$

= 2.7634; which means that the increase in one cow can increase the output of the farm by 2.7634 Ltrs.

For the simple linear production function, marginal productivity of labor, land and cow has been calculated. It is seen that the output increases by 2.8372ltrs, 9.0785lts and 2.7634ltrs when the inputs i.e. labor, land and cow are increased by one unit respectively.

4.3.3 Cobb-Douglas Production Function

When CD production function is converted to log linear form, and OLS regression is carried out following result has been obtained:

Table 4.9: Result of OLS Regression as Log Linear CD Production Function

Dependent variable: Y (Observation-24)				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**P-values**
Ln (L)	0.1314	0.2385	0.5509	0.5878
Ln (La)	0.6048	0.1942	3.1146	0.0054
Ln (C)	0.2288	0.2216	1.0324	0.3142
R- squared			0.69	
S.E of regression			0.2621	

Source: Computation with Microsoft Office Excel 2007 from table 4.7.

So, here the log linear equation of Cobb-Douglas production function is:

$$LnY = 2.8429 + 0.1314Ln\ L + 0.6048Ln\ La + 0.2288Ln\ C \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Expressing it in its original form yields the following equation: $Y = 17.1655\ L^{0.1314}\ La^{0.6048}C^{0.2288}$

From the results of model estimation using the Cobb-Douglas function model (shown in table 4.10) the result shows that the determination coefficient R-squared is 69.03 percentages. The determination value (R-squared) shows that 69.03 percentages of the production variation could be explained together by the factor of labor, land and cow. Meanwhile, 30.97 percentages is explained by other factors beyond the model. Other factors beyond the model which are thought to have influence on milk production are age, environment, weather, administration of drugs and vitamins, cattle environment, diseases etc.

The coefficient value in Cobb-Douglas function model is the production elasticity value of the production variables. At the time of study, holding the land and cow inputs constant, a one percent increase in labor input would lead an average of 0.1314 percent increase in the output. In the same way, holding the labor and cow inputs constant, a one percent increase in land input would lead an average of 0.6048 percent increase in the output. Holding the labor and land constant, a one percent increase in cow input, would lead an average of 0.2288 percent increase in the output.

Based on the result of the t-test it is known that the independent variables have statistical significant effect on milk production.

4.3.4 Marginal Physical Productivity for C-D Production Function

Marginal physical productivity of labor, land and cow has been obtained from the partial derivative of the above obtained equation with respect to labor, land and cow respectively. MPP_L, MPP_{La} and MPP_C in CD production function depend on L, La and C employed.

Now the Marginal Physical Productivity of Labor is;

$MPP_L = \frac{\delta Y}{\delta L} = \frac{\delta}{\delta L}(17.1655L^{0.1314}La^{0.6048}C^{0.2288})$

$= 2.2555La^{0.6048}\, C^{0.2288}\, L^{-0.8686}$

$= 2.2555(3.4583)^{0.6048}(9.2083)^{0.2288}(3.0417)^{-0.8686}$ (putting the average value of L, La and C)

= 3.0207; meaning that increase in one unit of labor can increase the output by 3.0207 percentage.

Again the Marginal Physical Productivity of Land is;

$MPP_{La} = \frac{\delta Y}{\delta La} = \frac{\delta}{\delta La}(17.1655L^{0.1314}La^{0.6048}C^{0.2288})$

$= 10.3817L^{0.1314}\, C^{0.2288}\, La^{-0.3952}$

$= 10.3817(3.0417)^{0.1314}(9.2083)^{0.2288}(3.4583)^{-0.3952}$ (putting the average value of L, La and C)

= 7.3585; meaning that increase in one unit of land can increase the output product by 0.1182 percentage.

And the Marginal Physical Productivity of Cow is;

$MPP_C = \frac{\delta Y}{\delta C} = \frac{\delta}{\delta C}(17.1655L^{0.1314}La^{0.6048}C^{0.2288})$

$= 3.9275L^{0.1314}La^{0.6048}C^{-0.7712}$

$= 3.9275(3.0417)^{0.1314}(3.4583)^{0.6048}(9.2083)^{-0.7712}$ (putting the average value of L, La and C)

= 1.7377; meaning that increase in one unit of cow can increase the output produced by 1.7377 percentage.

4.4 Problem and Prospects of Cow Farming

Cow faming in Chandragiri municipality have different kinds of problems and prospects. Some of them are pointed below.

4.4.1 Problems of Cow Farming in Chandragiri

There are various problems faced by the farmers in Chandragiri municipality. There are multiple responses about the problem of cow farming. Some of the main problems are mentioned below.

The availability of good quality as well as quantity of feeding materials is a major problem for dairy farmers. In many part of the study area April, May, October and November are the feed scarcity period. In these months, straw and other poor quality feed are being fed to cattle. The volume of milk declines in this period due to low nutrition. Another major problem faced by the farmers in the study area is the limited access to veterinary drugs. The farms that do use veterinary treatment for the animals do not always have access to good treatment options. The right time of medication and treatment is not taken for granted in local markets and often cattle remain sick because there is simply no right treatment available.

Another problem faced by the farmers in Chandragiri municipality is the price of milk paid by relative institutions is very low even almost all the farmers are not going to deliver the produced milk in any dairy institutions. Instead of improved breed cattle's local cattle's are mostly used in cow farming in Chandragiri municipality. Although there is availability of improved breed cattle's, it is unaffordable for farmers due to high price. Farmers also reported the lack of appropriate training on cattle's farming. So, it caused the lack of skilled labor in cow farming field. Besides this, according to the farmers of Chandragiri, there is weak implementation of policies in cattle's farming and lack of infertile alleviation program.

4.4.2 Prospects of Cow Farming in Chandragiri Municipality

Cow farming has greater prospects in the study area as well as all over the Nepal. Comparatively, it is more profitable than other traditional agriculture. Supply of milk and milk product by local producer is not sufficient in the current situation. And at the same time there is no any serious problem in transportation facility and market. So, it has better economic prospects to promote the cow farming in Chandragiri Municipality. Thus if all the respondents grow up their cow farming commercially instead of engaging in other prevailing traditional agricultural activities, they can

certainly receive better income. Better income helps them to improve their economic status by improving educational status, health status, social status and so the life style.

Commercial cow farming not only gives the better income to the farmers, it also generates the additional employment opportunities for people at various levels. The prevailing situation of disguised unemployment can also be removed to some extent by growing cow farming.

By using the dung and urine of cattle's in vegetable production, organic vegetables can be produced which may decrease the use of inorganic vegetables by the people. It may lead the people to the healthy life style.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Study

The general objective of this study was to perform the productivity analysis of cow farming in Chandragiri municipality. This study also presents some problem faced by the farmers during cow farming and prospects of cow farming in Chandragiri. This research is mainly based on the primary data. However, secondary data are also included as required. This study is analytical as well as descriptive type. To meet the targeted objectives of this study, structured as well as unstructured questionnaire have been used. Collected data has been analyzed in Microsoft Excel and they are interpreted by using Linear Production Function and Cobb-Douglas production function. And other objectives have been solved by elaborating the farmer's words.

a) According to this study, it is found that the cow and buffalo are the main source of milk production. In the context of Nepal, the share of buffalo milk is found to be 63.31 percentage and that of cow is found to be 36.69 percentage. In case of Kathmandu, the number of improved cow is found low with compare to the local cow i.e. only 9587 out of 22083 which is just 43.41 percentage. In the context of milk production, out of total milk production the share cow milk in the fiscal year 2015/16 was 27.71 percentage. This was in increasing trend and it became 30.53 percentage in the fiscal year 2018/19. On the basis of this study in Chandragiri, the production of cow milk was found to be 1632 ltrs per day at the time of the study. Out of the total cow milk production in Chandragiri, the share of local cattle was 67.71 percentage. While the share of improved cattle was 527 ltrs i.e. 32.29 percentage. And there are 220 cattle in Chandragiri of 24 farms. Out of total cattle, local cattle are 181 and that of improved cattle are 39. Where male cattle are 31 in which 30 are local and only 1 is improved cattle.

b) In analyzing the fit during OLS regression in fitted production function models, linear and Cobb-Douglas, R-squared value is significant around 67 percentages in both models which shows that these models are able establish the relation between inputs and the outputs. From the linear model, the

marginal physical productivity of labor is 2.8372 means that increase in one unit of labor can increase the output by 2.8372 ltrs. Similarly, marginal physical productivity of land is 9.0785 means that increase in one unit of land can increase the output by 9.0785 ltrs. In the same way, marginal physical productivity of cow is 2.7634 means that increase in one cow can increase the output by 2.7634 ltrs. Again, with the Cobb-Douglas model, it was found that the output elasticities of labor, land and cow (α,β and θ respectively) are 0.1314, 0.6048 and 0.2288 respectively; meaning that, holding the land and cow inputs constant, 1 percent increase in labor input would led on an average of 0.1314 percent increase in the output. Similarly, holding the labor and cow inputs constant, 1 percent increase in land input would led on an average of 0.6048 percent increase in the output. In the same way, holding labor and land inputs constant, 1 percent increase in cow input would led on an average of 0.2288 percent increase in the output.

c) According to the farmers, there are a lot of problems in cow farming in Chandragiri, out of them the main problems are; the high price of feeding materials due to monopoly of firm, lower output of local cow and the high price of improved cow are the major problems faced by the farmers. Lack of appropriate training on cow farming and the improved grass seeds are also the problems around the cow farming in Chandragiri. Besides this, the cow farming is the more profitable than other traditional agriculture as the supply of milk is insufficient by the local farmers in the Chandragiri is the main prospect of cow farming in the study area.

5.2 Conclusion of the Study

According to the major findings of this study, some conclusions have been drawn which are pointed with respect to the specific objectives of this study:

a) From the findings of this study, we can clearly say that the share of cow milk in milk production is lower than that of buffalo's share as the share of cow milk in total milk production is found to be just 39.69 percentage in the context of Nepal. Similarly in the case of Kathmandu, it is found to be 30.53 percentage in the fiscal year 2018/19 which is in the increasing trend. And it is seen that the local cattle has the vital role in the cow

farming as there are low number of improved cattle in Kathmandu. In context of Chandragiri at the time of this study, from 24 different cow farms, out of 220 cattle there are 31 male and 189 female cattle. And there are 181 local cattle and 39 improved. According to the findings of this study, 119 milking cattle out of 181 local cattle contribute 67.71 percentage of total milk production per day. While it was 32.29 percentage for 32 milking cattle out of 39 improved cattle.

b) The result obtained from the OLS estimation in fitted production models like Linear and Cobb-Douglas production function, shows that the value of parameters obtained in both models supports the economic theory. The findings with the marginal physical productivity of labor, land and cow from linear model gives the conclusion that the land is more effective than the labor and cow at cow farming in Chandragiri. This is again supported by the findings of Cobb-Douglas production function which reveals that the output elasticity of land is greater than that of labor and cow.

c) According to the findings of this study, there are a lot of prospects of cow farming in Chandragiri but low implementation of government policies. So, there should be strong or hard and fast rule to implementation of government policies.

5.3 Recommendations

Looking at the current trend of consumption and the market of the dairy products we can say that, cow farming is one of the most important business. By increasing the cow farming in greater extent, the earnings of farmers can be increased. Larger quantity of milk and milk products are still imported in Nepal, so, by increasing the production we can save large amount of forex flow to abroad annually.

The study underlines the possibilities of efficiency improvement of cow farming in Chandragiri. Through the many prospects of dairy farming in Chandragiri, it is still infant phase. So there should require efficient improvement in land, labor and cow productivity. The increasing trend of demand for dairy products in Nepali market suggests that the effective and optimal use of labor, land and cow in this field. From this study some suggestions can be included which are beneficial to the farmers and

will help to increase the revenue flows by using the optimal land, labor and cow in the future.

a) Result shows that the both production function models Linear and Cobb-Douglas satisfies and supports the economic theory, so use of these models can be effective to formulate economic plans and policies of cow farmers in commercial cow farming in Chandragiri.

b) Most of the farmers in the study area are found to be engaged in dairy farming as their traditional occupation. There is a need to aware the farmers about the modern farm management practices to get high benefit. It is suggested that District Livestock Service Office should organize the training program.

c) Farmers should be encouraged to keep improved breeds of cows. Artificial insemination, information about improved breed and cross breeding shall be made available to the farmers in their village situation. It is suggested that District Livestock Service Office should manage appropriate program for this aspect.

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QUESTIONNAIRE

1. General information

Name of the respondent……

Ward no……

Age ……..

Occupation …….

Education …….

Age …….

2. Numbers of family members

3. Land holding size

Types of land	Total area	
	Ropani	Ana
Wet land		
Irrigated		
Un-irrigated		
Dry land		
Irrigated		
Un-irrigated		
Pakho dry land		
Total land		

4. When did you start cow farming?

5. When did you start it commercially?

6. Number of cows you start cow farming with?

7. Did you increase the number of cow later on?

8. Did you involve in any training related to cow farming?

9. If yes, how long did you take, where did you take and which institution?

10. Are the trainings helpful for you to increase the production?

11. What is the average age of cow at first it calving in months?

12. What is the average dry period of cow in your farm?

13. What is the average lactation period of your cow?

14. What is the average calving period of cows in your farm (in days)?

15. Which type of shed do you have for your cattle?

16. Do you have another business besides this cow farming? If yes, mention it please.

17. Information about the initial investment to start cow farming.

(a) To buy cattle …… (b) To buy calf …… (c) To prepare shed ……. (d) Other……..

18. How do you start this cow farm?

(a) Loan

(b) Self investment

(c) Loan and Self investment

19. How much do you pay interest to the loan?

20. How many workers are there in your form?

21. Number of part time and full time workers in your form?

22. How much do you pay to the labor per hour?

23. What are the living expenses of full time workers?

24. Cost of feeding materials per day for a single cattle.

Feeding materials	Quantity	Per unit cost	Total cost
Quantity			
Straw			
Chocker			
Others			

25. How much is the average annual cost in treatment of cattle's?

26. Do you hire any land for cow farming?

27. If yes, how many and how much do you pay for this per day?

28. Cow farming system.

Cow	He calves	She calves	Milking	Dry	Total
Local					
Improved					

29. Production and selling.

Cow	Milk unit		calves	
	Production	selling	production	selling
Local				
Improved				

30. Price of milk and milk product

Milk products	Per unit price
Milk	
Cheese	
Yogurt	
Ghee	
Others	

31. Where do you sell the milk?

(a) To consumer directly

(b) To direct collection centre

(C) To distant market

32. Have you got any help or subsidies from government?

33. If yes, what kind of help or subsidies?

34. What are the main problems of cow farming?

35. What should be done to solve these problems?

36. What would you suggest the people who want to involve in cow farming?