

**PROBLEMS AND PROSPECTS OF RAINBOW
TROUT FISH FARMING IN NUWAKOT
DISTRICT**

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Declaration

I hereby declare that the thesis entitled **The Problems And Prospects Of Rainbow Trout Fish Farming in Nuwakot District** Submitted to the Central Department of Rural development . Tribhuvan University, is entirely my original work prepared under the guidance and supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources of the this thesis have not been presented or submitted anywhere else for the award of any degree or for any other purpose. I assure that no part of the contents of this thesis has been published in any from before.

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Letter of Recommendation

The thesis entitled **Problems And Prospects Of Rainbow Trout Fish Farming in Nuwakot District** Industries has been prepared by **Bhupendra Prasad Bhusal** under my guidance and supervision. I hereby forward this to the evaluation committee for final evaluation and approval.

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Abstract

This study deals with the **Problems And Prospects Of Rainbow Trout Fish Farming of Nuwakot District**. It is an Important occupation which could generate income and employments in rural areas.

This Study covers only **Kakani VDC 4 Ranipauwa Nuwakot District**. The general objectives of the study is to diagnose the problem and prospects of trout farming in Trishuli for the study the extensive field visit was conducted in Nuwakot District. Hence, the findings and recommendations of this study may not be applicable on other place. It is based on empirical data alone with available pertinent was applied. For primary data generation, structured questionnaire. Informal interview from key- informant and observation method were applied. The study is descriptive and analytical in nature in which descriptive statistics is applied for the analysis of the data. The analysis of the data is done manually/ 38 cottage and small industries are taken on the basis of universal method on different words of Nuwakot District.

There are some problems in goods production and, marketing such as lack of institutional credit services, low price of goods insufficient raw materials unprotected government policies and so on. Specially the products and services are for local areas. There is further possibility of market expansion.

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CHAPTER ONE

INTRODUCTION

1.1 General Background

Rainbow trout was introduced in Nepal from the United Kingdom (UK) and India in late 1960s and early 1970s and reintroduced from Japan in 1988. Rainbow trout is one of the most suitable fish for commercial farming in coldwater. Nepal basically a mountainous country (83% of its area covered by hill and mountain) is known to possess second largest fresh water resources of the world. Trout farming in Nepal exists in two fisheries Research Centers: Trishuli and Godawari. Trout farming can be taken as a typical example of cold-water fish husbandry (Davis 1961, Huet 1992). Its farming success depends upon the types of feed on which one plans to rear them (Chittino 1972) besides amount of water and seed fish (Murayama 1983). Therefore, today it is being cultured at government farms on an experimental basis (Joshi and Western 1995).

Although the indigenous fishes, Asala and kattle are much in demand for their taste, their culture cannot be commercially profitable as their growth is much slower. Therefore, there is a need for fast growing fish species which can be cultured for the establishment of cold – water fishery in country. Rainbow trout, which is most widely cultured all over the world, may be the answer to this question. Realizing the feasibility of trout in cold waters of Nepal, the technology for their breeding and culture has been developed in the fisheries research centers Godawari and Trishuli under NARC.

In Nepal Agriculture sector plays a critical role in the Nepalese economy as this sector still contributes 33.1% which is more than one-third to Nepal's GDP, and more than two-third of its population depend on it for their employment and livelihood (MOF, 2013/2014). Nepal is one of the major countries for having abundant cold freshwater resources in the world; however, these water resources have been poorly used. Rainbow trout being a cold-water fish has high potential to cultivate in Nepal particularly in hilly region where cold water streams prevailed well. People living in the hilly region have less opportunity to increase their income to better their livelihood. Rainbow trout farming could be an important source of their income and providing job to the people living in such regions. Rainbow trout can also support eco-tourism through developing recreational based fisheries for fishing opportunities to tourists in hill streams. However, effort on that direction is required. Trout farming has bright prospects for expansion as Nepal is rich in cold water resources from east to west in the hilly region.

The cultivation of Rainbow trout farming is the new special programme on agriculture sector which can help uplift the society and nation. Fishery is promising, small but important sector of agriculture in Nepal. It contributes about 2-3% to agricultural gross domestic production and less than 0.5% contributes to gross domestic production (MOF, 2013/14).

Rainbow trout is one of the best known fish for commercial farming in cold waters. The flesh of trout is considered high quality products because of its specific composition, which

supports healthy cardiac function and memory sharpening . The commercial cultivation of trout was started as early as in 1853 in USA (Bardach,1972).

Trout is high value, exportable agricultural commodity consumed in urban area by resource rich people, however, efforts are needed to make the trout available to everyone. Earlier about two decades back in Nepal chicken is also considered as rich person food, however, presently chicken meat are sporadically available regardless of urban and rural area.

Cold water fish culture in the mid hills is at the very beginnings although a few ventures show that it is a profitable enterprise. Rainbow trout is the best suited exotic fish for growing commercially in mid hills of Nepal. The culture technology and seed of rainbow trout are available in the country.

Rainbow trout could not survive due to the lack of technical know-how and was re-introduced from Japan in 1988. During this period, the Nepal Agricultural Research Council developed the breeding and culture technology for this species. Rainbow trout is a carnivorous species which requires high protein feed and well oxygenated water. In nature it feeds on aquatic insects, small crustaceans and small fish. It can be cultured using artificial feed of no less than 20 to 30 percent of animal protein.

Rainbow trout is able to live within a temperature range of 0-25°C and it grows at the water temperature range of 10-20°C. The fish reaches commercial size (300-400 g) during the second year (Huet,1975). In Trishuli, Nepal, it reaches 300-400 g within 14-months from the free-swimming larval stage (FRS, Trishuli), depending on the quality of the feed, adequate supply of water of suitable quality, including a suitable temperature and dissolved oxygen concentration. Rainbow trout was bred for the first time in Nepal in 1990 and its culture was initiated experimentally in 1993. Present trout production is more than 30 metric tons annually from two government stations, and about 110-120 metric tons from the private sector. Mr.PurnaBahadur Lama from Kakani Village Development Committee-4 of Nuwakot District is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on a trial basis. Presently, he has been growing 40,000-60,000 fingerlings of rainbow trout each year in an area of 620 m².

Two Fisheries Research Stations, Godawari and Trishuli, under the Nepal Agricultural Research Council (NARC) are raising rainbow trout from eggs to adults and vice versa. Both stations are culturing the fish in concrete raceway ponds. As a source of water, spring water at Godawari and river (glacier and snow melt) water at Trishuli are used. The total area of ponds for trout culture at Godawari is nearly 300m². Trishuli station has about 1150m² has been used for grow-out fish and the rest for breedstock of trout as well as for native fish species.

Presently, 25 private farmers from Kakani, Nuwakot district has been involved in trout farming . This is a positive sign in the development of trout aquaculture entrepreneurship. They can produce 90-91 metric tons of trout annually under present conditions.

1.2 Statement of the Problems

Rainbow trout fish farming is one of the promising industries related to agriculture sector. Rainbow trout fishing is a newly introduced species is gaining its popularity as sport and food value fish. Lack of adequate capital, difficulties regarding the development of infrastructure, lack of practical knowledge for its production, in sufficient assistance from government are the serious problems that might discourage the farmers who are eager for trout farming. Due to lack of proper technical knowledge and being a cool -water species its production in our country is very limited which has made it fairly costly and probably limited to certain hotels, restaurants, and some of the diplomatic offices in Katmandu. Thus, this particular species which is being cultured here on an experimental basis, holds a greater future potential and the successful culture of it will surely contribute a great deal towards import substitution and export promotion generating foreign currency. Therefore, the study is concentrated to find the answer of the following question

1. What is the Present status of rainbow trout farming in Trishuli corridor?
2. What are the Problem of this farming ?
3. What are the role of trout farming in to uplift the living standard of farming ?

1.3 Objectives of the Study

The main objectives of this study is to diagnose the problem and prospects of trout farming in Trishuli corridor.

The specific objectives of the study are stated as below:

1. To analyze the present statu of trout farming in Trishuli corridor. .
2. To find out the specific problem of this farming .
3. To assess economic role of this farmings in Nuwoko district .

1.4 Importance of the Study

It is believed that present study would diagnose the problem and prospects of trout farming in in Trishuli corridor. Therefore the significance of the study aims to find problems and prospects of trout farming. It could also be beneficial to policy makers to formulate appropriate policy.

1.5 Limitations of the Study

- This study was limited on the boundary of trout farming in Trishuli corridor at kakani in Nuwakot district.
- This study has been done in nuwakot district only so that it was not represent the condition of other district

1.6 Organization of the Study

The study is organized in order to six chapters. First chapter provides introductory information which includes background of the study, statement of problems, objectives of the study, and limitations of the study. Second chapter present literature review that describes about the concept of cost and benefit analysis of rainbow trout fish farming success story of rainbow trout fish farming in national and international level and the review of previous studies. The third chapter relates to the research methodology that describes research design, study area and rational for its selection, nature and sources of data, the universe and sample, technique and tools of data collection and data analysis interpretation. Fourth chapter describes presentation and analysis of data. Fifth chapter presents the issues and present status of rainbow trout fish farming and the sixth chapter presents the summary of the finding, conclusion and recommendation of the study.

CHAPTER TWO

LITERATURE REVIEW

Rainbow trout was first introduced in Nepal in the late 1960s and early 1970s from the United Kingdom, Japan and India, and was re-introduced from Japan in 1988. Now the breeding and culture technology of rainbow trout is well developed.

According to Swar DeepBahadur in 1999, on the basis of available reports which fishery is small but important sector of agriculture in Nepal. It contributes about 1.75% to agricultural gross domestic production. Cool and cold water streams and rivers in Nepal extending from the Himalayas offer excellent habitat to 76 native (Rajbansi 2002) and 3 exotic cold water species (including Brown trout and Among Trout Perhaps do not exist in Nepal, and Rainbow trout). The native cold water fisheries sources offers vast scope for development of cold water aquaculture, however, at present this sector is predominant by subsistence and recreational fisheries only. Cold water native species for their aquaculture promotion is still in its infancy. It is only few indigenous species that have been domesticated and propagated for cultivation purposes. Their culture has yet to be adopted by the private sectors. Among the exotic species, rainbow trout cultivated cold water salmonid throughout the temperate world (Bardach et al. 1972). In Nepal, its farming practices has recently been started to adopted (Rana 2007)

Rainbow trout culture in Trishuli is being practiced in water coming down from glaciers, where as spring water is used in Godawari Station. The area of trout farm at Trishuli is about 2,000 Sqm where as it is nearly 300 Sqm at Godawari. The breeding of rainbow trout was initiated around 1990. The experiment on rainbow trout cultivation started around 1993. At present, production technology has been developed and verified in farmers' raceways. To date private sector involvement is limited. However, the private farmers are attracted towards trout farming in Nuwakot and Rasuwa district. Number of trout farmers is being increased every year and production is also increasing. Mr. Purna Bahadure lama (Mr. Gopal lama) of kakani VDC-4, Ranipauwa, Nuwakot District is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on the trial basis. Presently he has been growing 10,000-20,000 fingerlings of rainbow trout each year in an area of 136 Sqm (Nepal . 2002).

Total production of trout in Nepal is estimated about 17 mt in the year 2006 is where production from private sector contributes 60 percent, However, total annual fish production in Nepal is estimated to be 42,463 mt, of which captured fisher accounted about 47 percent Majority of the production came from private sector. At present annual trout production in Nepal ranged between 10-15 mt. Trout production in Nepal in 1993 was about 318 kg which was 1565 kg in 2005.

Rai (2002), Economic analysis shows the cost benefit analysis of trout farming based on the case of a private farm of Nepal . The present farm get price of per kg trout is 350 NRs. The price could go up to 650 NRs depending upon the demand (season) and size of the fish. Smaller trout can be sold at higher prices. As there are limited farms, people visit these private trout farms and farmers cook and sell their trout to them on the farm. If there is low

demand, farmers can smoke their trout and keep it for longer periods or send it to nearby towns as well. Cooked trout can be sold at 25-30 percent higher prices.

The impressive net profit of annual rate of returns (40 percent), returns on investment (56 percent) and gross margin (66 percent) should be the attraction for more private farmers to adopt trout farming. As feed cost is nearly half (47 percent) of the total cost of production and this cost could be reduced to (30 percent), there is still room to increase the profit margin if a cheaper feed, using locally available resources, could be formulated through research.

According to Poudyal (2003), Fisheries sector is becoming one of the potential activities in Nuwakot district. Some of the farmers of Nuwakot district have initiated this business; however, their economic enhancement has yet to be traced. The study to find out the economic enhancement of the farmers involved in exotic cold water fish (*Onchorhynchus mykiss*) was conducted at potential areas of Nuwakot district where only four farmers were found to be involved in these areas. The benefit cost ratio of those farms business was ranged from 1.024 to 1.66. It might be due to high cost for the feed which made production cost high. The cost of production of government farm was about NRs 170 per kg but at farmer level it was about 250 per kg. The selling price of the trout was about NRS 300-600 per kg depending on the time and consumer type. Trout cultivation has wide scope within as well as outside the country. Neighboring countries like India, Pakistan, Bangladesh, Thailand and China has wide demand of it. Though the main market of the trout is not well specified, big hotels and restaurants and some of the diplomatic groups with high income level can purchase. Marketing channel of this fish business was found very simple, that is, producer to consumer without any intermediaries. Transportation system is so simple since fresh meat is consumed and it is transported through local vehicles by packing in the plastic crate with ice. Through the study it can be said that there is immense scope of enhancing economic level of the farmers through trout business if the farmers are provided with loan facility, Technical backstopping and related inputs.

Basnet (2005), Trout farming has become success in Nepal after more than a decade of continuous and entiring efforts. It generates not only the income to the farmers but also creates employment opportunities to the people living in the mountainous and hilly region. In addition, it has potential to be exported overseas and earn foreign currency. Rainbow trout can also attract internal tourist and provides fresh fish in restaurant as well. In order to expand the industry, government should initiate and take interest support providing subsidizing as well as technical support. Eco-geographically and Socio-economically there is higher scope of farm establishment throughout the country especially in mid and high hills integrated trout farmers have demonstrated that trout integration can increase the farm land productivity by 12 times higher than the traditional farming. In several other locations this kind of farms could be developed where trout can be integrated with other commodities. This type of integrated approach would indeed enhance farm land productivity several fold for livelihood enhancement and poverty alleviation of hill farmers.

Khanal and Gautam (2007), Rainbow trout farming practice is expected to have high potentiality to be scaled up in mid hill and mountainous region of Nepal. Despite of its

potentiality, the farming is restricted only to a very few farmers of Nuwakot district. Successful trout farming demands high hills, expertise and specific managerial requirements which might pose problems to find our appropriate site for trout farming it might to be the reason that some of the trout farmers have perceived trout farming the trout farming activities in present in present socio-economic perspectives a schedule interview in Nuwakot district was performed. High demand of trout with the lucrative market price the trout farming a viable enterprise in the mountains and hills of Nepal. Possibility to utilize abundant sloppy land, natural spring water, link with hotel business and agro tourism were the potentialities realized for rapid scaling up of trout and production cost, difficulties in availability for fish fry, technical aspects of farming, high starting and production costs difficulties in availability of feed were considered the major constraints for scaling up of trout farming technology at farmers mostly prefer easier provision of financial support with low interest rate and appropriate valuation of their trout farming lands for loan sanctioning Intensive technical trainings for starter farmers, effective mechanism for availability of fry fish and group approach in feed management are some recommendations of farmers on scaling up of rainbow trout farming to the similar areas within the country.

Gurung, (2008), Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in Hills and Mountains to produce trout whether adequate fresh cold running water is available. The economic context is encouraging for trout farming in Nepal. Both men and women can contribute in various levels of production and marketing activities. Technology is not a major problem but promotion of these technologies in farmer's field in suitable agro-ecological reasons is urgently required. Trout farming has been carried out in the marginal land, since trout farming utilizes marginal land, therefore, from scaling-up perspectives it seems high potential for trout commercial production. With the minimum investment in the trout, the farmers can earn more income so it is more beneficial for the farmers. Currently there is a small production and small-scale marketing system which mean that generally trout can only be sold in the area closed to the trout farms and around Kathmandu valley. There is some sale to few star hotels, restaurants and stores in Kathmandu, but demand is very high and most hotels asked to supply trout products from farms because they require high quality processed products. Many wealthy people belonging to do family visited the trout farm for recreation and taste trout in farmer's restaurants. They even can enjoy the trout harvesting by themselves in farmers ponds. This situation provides a healthy business atmosphere and in reality it has a multiplying effect on the economic condition of the rural people because both are owner and non-owner derives income from the same area.

High demand of rainbow trout and good return to the farmers in the study area indicates the potentiality of scaling-up rainbow trout in those areas where technical and managerial aspects of trout farming is met. Integrated approach of trout farming associated with hotel business seems to be more profitable. Intensive technical backstopping for the trout growers and frequent visits from technicians in the farming areas could help in minimizing technical difficulties encountered by the trout growers. Government need to formulated appropriate mechanism for easy and adequate availability of fry fish to the farmers. Farmer's group approach in feed management could solve the availability and high cost of

feed. Moreover, promotion of cooperative concept by federating the interested trout farmers in the potential areas.

Trout farming is not profitable and feasible for the subsistence farming. For the profitable trout farming, initial investment is comparatively high which cannot be afforded by many small and medium scale farmers of Nepal. Easy access to the soft loan for establishment of the trout enterprises is the must to promote the trout farming at commercial level. The sloping land used for rainbow trout farming should be valued as part of trout enterprises and thus valuation while sanctioning loan should be done accordingly. By adopting integrating approach of fish farming, generating electricity, running the water mills and using the drained water from the pond for irrigating the high value agriculture crops, trout farming could be made more inclusive to the community members. The use of the drained water from the ponds for the high value crops growers, relatively poor member of the community who cannot afford the trout farming, would also promote the social inclusion process. This will also help justifying the public financial institutions, e.g., agricultural development banks, that the money is invested or the benefit of all kinds of the farmers including the poor members.

Karki (2013) the largest cost item in rainbow trout farming is capital cost including construction of raceway, 24 hour running water supply system, store house; and procurement of nets, grader and related equipments. It was estimated that about Rs 876 thousand was required to construct 200 m² concrete raceways and water supply system in 2012. Similarly, construction of store and guard house required Rs 181 thousand. Another 37 thousand was estimated for procurement of different types of net and related equipments. Among the operating costs, feed is the most important item accounting for about 48% of total operating costs. Other major cost items are interest on credit, remuneration of human resources including manager and labor/security guard, depreciation of capital items, procurement of small equipment/utensils and utilities. The cost benefit analysis shows that total annual operating cost of an average farm is about Rs 1.5 million whereas value of production is Rs 1.9 million meaning that an average farm of 200 M² raceway can earn a net profit of Rs 380 thousand per annum. In terms of a per kilogram of fish production, cost was Rs 598 whereas average farm gate price was Rs 750 in November 2012, resulting in to a profit of Rs 152 per kg of rainbow trout production. The question is “why there is no production boom if the business is relatively lucrative?” The major reason given by the stakeholders was that entrepreneurs often hesitate to invest in this business for two reasons: first, initial cost is very high and second that high fry mortality was experienced in some of the cases in the past.

Producers are found to have largest share in profit from rainbow trout value chain, followed by wholesaler/retailers. This is justified as a farmer has to spend as much as Rs 598 per kg production and has to wait 12-14 months for the fish to gain average weight of 200 gram. Producers are found to have largest share in profit from rainbow trout value chain, followed by wholesaler/retailers. This is justified as a farmer has to

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The cost benefit analysis shows that total annual operating cost of an average farm of 200 M² raceway is about Rs 1.5 million whereas value of production is Rs 1.9 million meaning that an average farm can earn a net profit of Rs 380 thousand per annum. In terms of per kilogram of fish production, cost was Rs 598 whereas average farm gate price was Rs 750, resulting in to a profit of Rs 152 per kg of rainbow trout production to producers. The average cost of handling and packaging is Rs 25 per kg, cost of transportation Rs 20 per kg and cost of weight loss & others Rs 25 per kg. This adds up to Rs 820 per kg when it reaches to urban centers. However, retail price in Kathmandu and Pokhara during the survey period was recorded from Rs 950 to 1000 per kg, meaning that profit margin to traders was Rs 130 per kg of the product sold. The present profit margins of producers to traders show that there is enough space to improve the value chain efficiency. The value chain of rainbow trout is small and simple. Basically, it starts from suppliers of seed and feed. Initially Nepal Agricultural Research Council (NARC) used to supply brood fish to hatchery. Now those hatcheries have been selecting and maintaining brood stock. They produce and supply fry to their own farm as well as to other farms. Similarly, several rainbow trout farms produce feed for their own farm and also supply to other farmers. On-farm testing of rainbow trout at individual farmers' own management conditions and its economic analysis indicates that trout farming is technically feasible and profitable in places where suitable agro ecological conditions prevail. Major factors that provide high potentials of increasing rainbow trout fish in Nepal include several rivers originating from the Himalayas and flowing through the hills, sloping lands with poor fertility status that have low opportunity cost, very high rate of return on investment, high demand and ever increasing prices, scope of product diversification and multiple use of water resource.

The growth of rainbow trout culture in Nepal has been large. Production in 1993, when research on full-scale operation initiated, amounted to 0.318 Mt, and by 2006, production reports ranged from 12-17 Mt (Rai et al., 2008; Swar, 2007). While Swar (2007) attributes 60% of current rainbow trout production to private operations, Thakur et al. (2008) argues that this figure is closer to 75%. The first private operation was conducted on a trial basis by a single farmer in 1998 (Swar, 2007). As of Rai et al.'s 2008 report, there were 12 rainbow trout operations in the private sector; of which, ten were deemed profitable. A total rearing unit surface area of 1270 m², with an average of 15-20 kg/m²/year, resulted in a total production of 12 Mt in 2006 (Rai et al., 2008). Though still considered limited, the private sector's contribution to the Nepalese rainbow trout's industry is expected to grow (Swar, 2007)

CHAPTER THREE

RESEARCH METHODOLOGY

Research Methodology

This chapter deals about sets of methods which were employed in this study.

3.1 Research Design

This research had adopted exploratory and descriptive research design. It was exploratory in the sense that in contrast to deductive approach, it tried to explore and explain the phenomenon by accumulating primary data and building casual relationship between the variables. The historical and other references were also taken for assistance of the micro level. In order to fulfill the objectives, information has been collected from the Household survey, informal meeting, focus group discussion, key informant interview and observations which were the main techniques that have been used to obtain the information.

3.2 Nature and Sources of Data

Both primary and secondary information sources are used for the fulfillment to the objective of the study. The study is basically based on field survey where as secondary sources of information were used from the relevant sources. Primary data was collected through questionnaire, interviews and observation method. So, the information and data collected are both of qualitative and quantitative in nature.

3.3 Methods of primary Data Collection

3.3.1 Household Survey

Interview schedule was designed for the collection of data. Structured, unstructured and open ended question was prepared to seek the information on various aspects of the study. Interview schedule was field visiting the particular study area.

3.3.2 Sampling Design

The data is both qualitative and quantitative in nature. A simple random sampling method was applied during the primary data collection for household survey. 14 population samples of farms were selected from 25 farms (56%) by lottery method. For simple random sampling, the population list was obtained from the study area. After gathering the household information, lottery method was applied.

3.3.3 Questionnaire

Questionnaire for Household, Hotels and Supermarkets were prepared for the collection of the data of the study area. Closed questions were included for getting the information of the

topic. The local rainbow trout fish farming farmer of the particular study area were requested to fill up the questionnaire.

3.3.4 Observation

Observation method was also used to obtain the information. Each farm selected in sampling was visited. The socio-economic status of the rainbow trout fish farming farmers was observed and the data were recorded.

3.4 Methods of Analysis

As discussed above, the data were collected through various sources using various data collection techniques and tools. The data were scientifically processed with the help of computer program, formulaic method and descriptive way. After editing, coding and tabulation of the data, the conclusion was drawn for the presentation through different types of tables, charts and figures.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction of Site

Kakani VDC was selected for the study. This village is 27 km north-west from Kathmandu and about 43 km South-east from district headquarter. The village is linked by motor able road from PasangLhamu Highway. The village is famous for strawberry farming, rainbow trout fish farming and a best place for picnic sport. There is international Mountaineer Memorial park also. It is a touristic place which is famous for cycling, site seeing and so on.

Kakani VDC is situated at the elevation level of 2000m from the sea level. The village comprises hills on east, west and south and north with the beautify site seeing of Himalayas. It extends approximately 7 km east to west and 6 km north to south. The political boundaries of Kakani VDC include on its Eastern side Thanapati VDC, on its Western side Madanpur and Chaturale VDC on its Northern side Thansing VDC and on its Southern side Okharapauwa VDC. The VDC has mountaineers Memory Park on the east, Pasang Lhamu highway on north-west and so on. The Syaule Khola and Dovan are the major sources for water for trout farming in the study area.

Kakani VDC has been divided into nine wards and each ward included two to four hamlets or toles. There is one higher secondary school, one primary Health Center and International Buddhist Library too.

According to the census of 2011 (2068 BS) the total population of Kakani VDC is 7604. Among the total population 3761 are male and 3843 are female. The majority of the people are Tamang with representation of 65.65% the total population. There are 1396 households among them 25 household has adopted commercial rainbow trout fish farming as their occupation. Among the total population 80% people are involved in agriculture activities while 45% people are below the poverty line of total rainbow trout fish farming farmers 14 household have been selected as primary respondents for the purpose of the study.

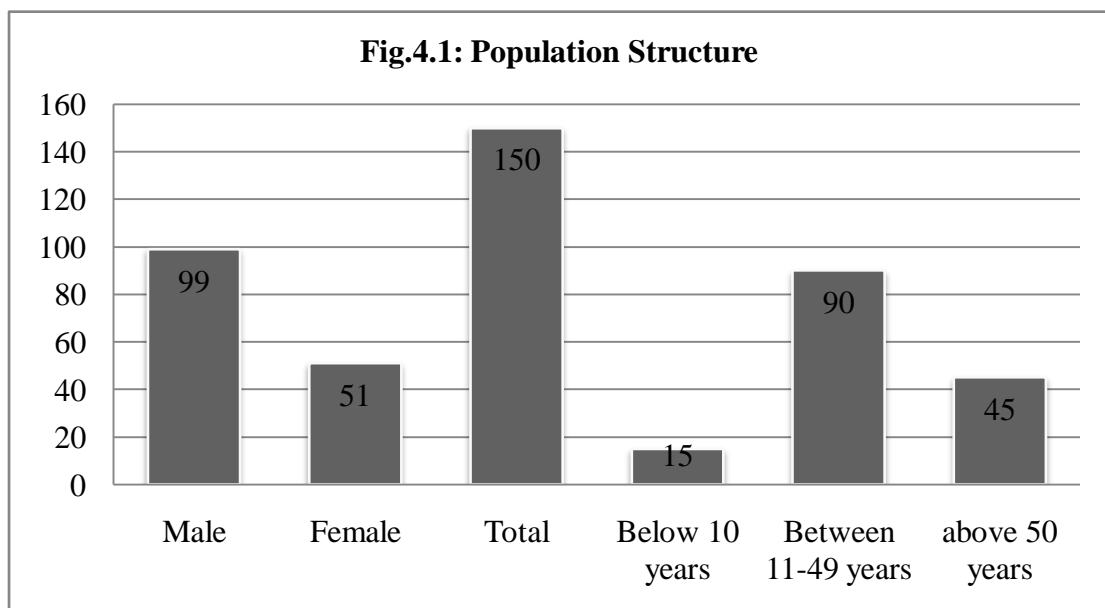
4.2 Socio-economic Profile of Respondents

Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in hills and mountains to produce trout wherever adequate fresh cold running water is available. The socio-economic context is encouraging for trout farming in Nepal. Both men and women can contribute in various levels of production and marketing activities. Technology is not a major problem but promotion of these technologies in farmers field in suitable agro ecological regions is urgently required. Trout farming has been carried out in the marginal land. Since trout farming vitalizes marginal land, therefore, from scaling-up perspective it seems high potential for trout commercial production. Currently, there is a small production and small-scale marketing system which means that generally trout can only be sold in the area close to the trout farms and around Kathmandu valley. There is a some sale to few star hotels, restaurants and

stores in Kathmandu, but demand is very high and most totals asked to supply trout products from farms because they require high quality processed products. many wealth people belonging to do family visited the trout farm for recreation and taste trout in farmer's restaurants. They even can enjoy the trout harvesting by themselves in farmers pond. This situation provides a healthybusiness atmosphere and in reality it has a multiplying effect on the economic condition of the rural people because both the owner and non-owner derive income from the same area.

4.2.1 Population Structure

During questionnaire survey, question related to the households size, gender and age group was asked to the available respondents of the family. The population was categorized into three age groups, below 10 years, between 11 to 49 years and above 50 years on the basis of their contribution to the trout fish farming. The population of trout famers was 150 as shown in figure 4.1.



Source: Field Survey, 2014

Population of male was more (99) comparing to the population of female (51) in the studied trout farming. This proves the social as well as economic status of the farmers according to gender perspective and most of the respondents were male because of opportunity to involve in activities which is out of household area. The female are still within the boundaries of four wall of the house. This is because male were out of their home for their education, work and training than the female people of age between 11-49 years were able to work in the trout farm easily and help their family for generating income more than 60% people were able to work hard and got benefit from trout farm.

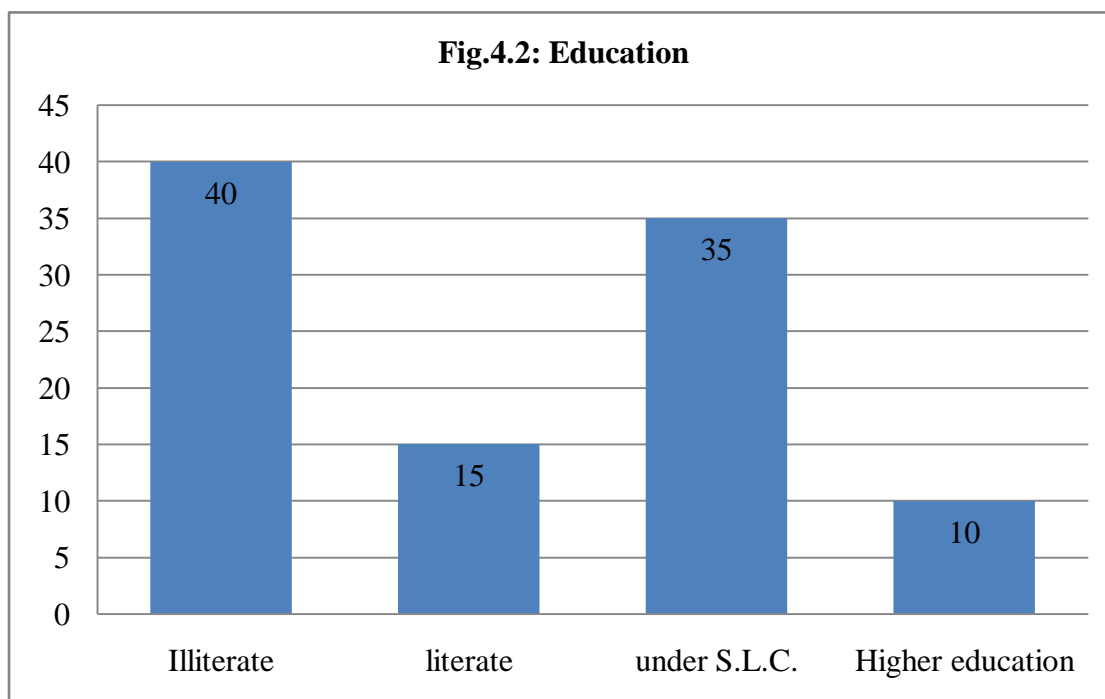
4.2.2 Education

Table 4.1 Education Status of Respondents

S.N.	Education Level	Number of Respondents	Percent	Remarks
1	Illiterate	3	40%	
2	Literate	5	15%	
3	Under SLC	4	35%	
4	Higher Education	2	10%	
	Total	14	100%	

Source: Field Survey, 2014

Question related to education was asked to the respondents. For different categories of education as shown in figure were constructed. Among the respondents, there were 60% people literate and 40% people illiterate as shown in figure 4.2.



Source: Field Survey, 2014

The literacy rate of the respondents was less than the national literacy rate of population 65.9% (CBS, 2011). There were very less people pursuing higher education. Many people were unable to pass the SLC examination. Literacy rate of young children was higher and old people were low as old people were deprived of education in the past time. It shows that, more people are available in household and they also limiting to involve in rainbow trout fish farming strategy marking.

4.2.3 Land Holding Size of Respondents

During questionnaire survey, question related to land holding status was asked to the respondent. Bush/shrub, grass, ponds/lakes, sandy area, waste and barren land and water bodies were selected to be included in the study. Table 4.1, shows the various land use/lands cover of the study area.

Table 4.2: Land Holding Size of Respondents

Description	Area (Ropani)	Percentage (%)
Bush/shrub land	5	2.73
Cultivated land	40	21.86
Forest land	25	13.66
Grass land	20	10.93
Orchard/nursery	10	5.46
Plantation	3	1.64
Ponds/lake	5	2.73
Rock	35	19.13
Sandy area	5	2.73
Waste and barren land	25	13.66
Water bodies	10	5.46
Total	183	100.00

Source: Field Survey, 2014

The above data shows that, the maximum land is used for cultivation which were utilize as growing different crops and vegetables and the smallest area of land is use for the plantation which include different types of tress, which absolve the rain water and provides the cooler environment to the raceway for the survival of trout fish.

4.2.4 Livestock Kept in the Hoses of Respondents

Table 4.3: Livestock kept in the houses of Respondents

S.N.	Live stock	Number of Animals	Percent of the live stock	Number of Respondents	Remarks
1	Cows	8	7.69	2	
2	Buffalo	9	8.65	4	
3	Goats	33	31.73	3	
4	Chicken	54	51.93	5	
5	Others	0	00	0	
	Total	104	100.00	14	

Sources: Field Survey, 2014

Livestock is an integral part of agriculture. Livestock and agriculture have direct inter-linkages because livestock is a means of food and fertilizer is animal dung which is also the major sources of biomass energy. For this reasons, keeping livestock is a must for the peasants. On the other hand, the unused green pants and herbs are ultimate food for their animals and they require to keep animals for using or utilizing the byproducts of agriculture. Though the concerned governmental agencies and NGO's have been promoting fodder tree plantation but because of inadequate education and lack necessary technical expertise, it is not as common as expected. a similarly, in Kakani village as well people traditionally keep

livestock for agricultural purpose but for commercial purpose. This also determines the status of the family in rural context.

4.2.5 Occupation of the Respondents Beyond Rainbow Trout Fish Farming

Most of the people of the study area are occupying in agricultures their main source of livelihood. Rainbow trout fish farming is adopted commercially in Kakani form a decade age. Only aspect of the household of the study area. This area is dominantly depends on the agricultural activities. So, almost all people involve in another occupational part of the society. The involvement of farmers in other activities rather than agriculture is another part of socio-economy which reflects the living standard of the respondents.

Table 4.4: Other occupation of the Respondents

S.N.	Involvement in another occupation	Number of respondents	Percent	Remarks
1	Yes	10	75	
2	No	4	25	
	Total	14	100.00	

Source: Field survey, 2014

Table 4.5: Other Occupation held by Respondents

S.N.	Occupation	Number of Respondents	Percent	Remarks
1	Job	4	40	
2	Business	4	40	
3	Agricultural activities	2	20	
4	Others	0	00.00	
	Total	10	100.00	

Sources: Field Survey, 2014

Among the total respondents who involved in another occupation activities along with rainbow trout fish farming 40% has their own business, 40 % have service and 20% involve in another agricultural activities.

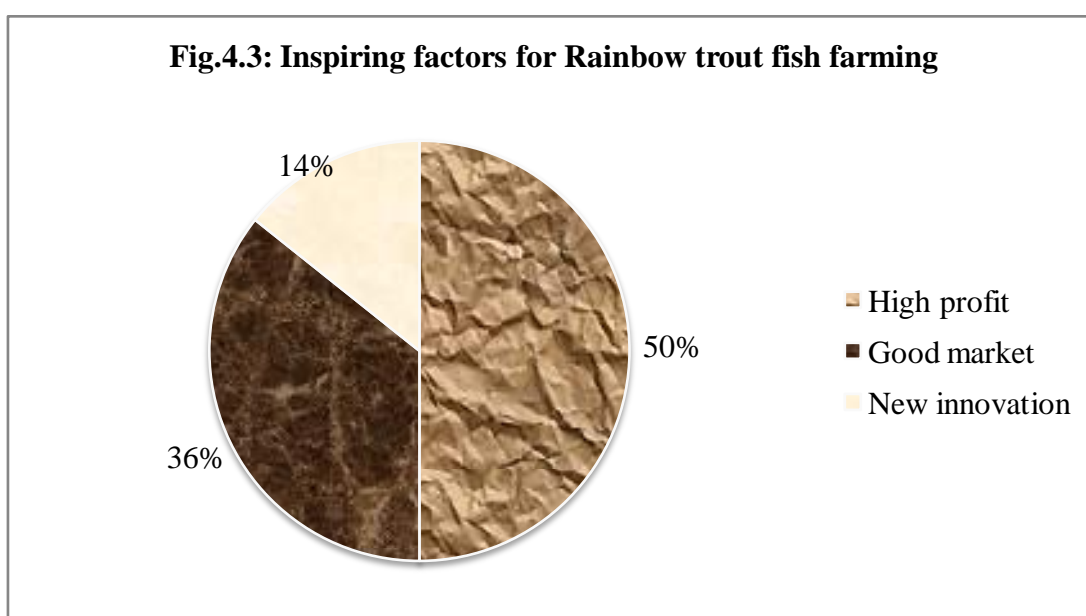
4.2.6 Inspiring Factors for Rainbow Trout Fish Farming

For doing the new things there is need of believers and inspiring to do it. Being a new innovation in Nepalese fisheries industry rainbow trout fish farming has become the promissory farming for the farmers which the priority to the government sector too.

Table 4.6: Inspiring factors of Rainbow Trout Fish Farming

S.N.	Factors of Inspiration	Number of Respondents	Percent	Remarks
1	High Profit	7	50%	
2	Good Market	5	35.7157%	
3	New innovation	2	14.2843%	
	Total	14	100%	

Source: Field Survey, 2014



Sources: Field Survey, 2014

The diagram shows that major inspiring factor of the rainbow trout fish farming to get high profit where 50% of the respondents answered it 35.72% respondents believe that there is good market for their production and 14.28% believe it as the new innovation to transform their livelihood to betterment.

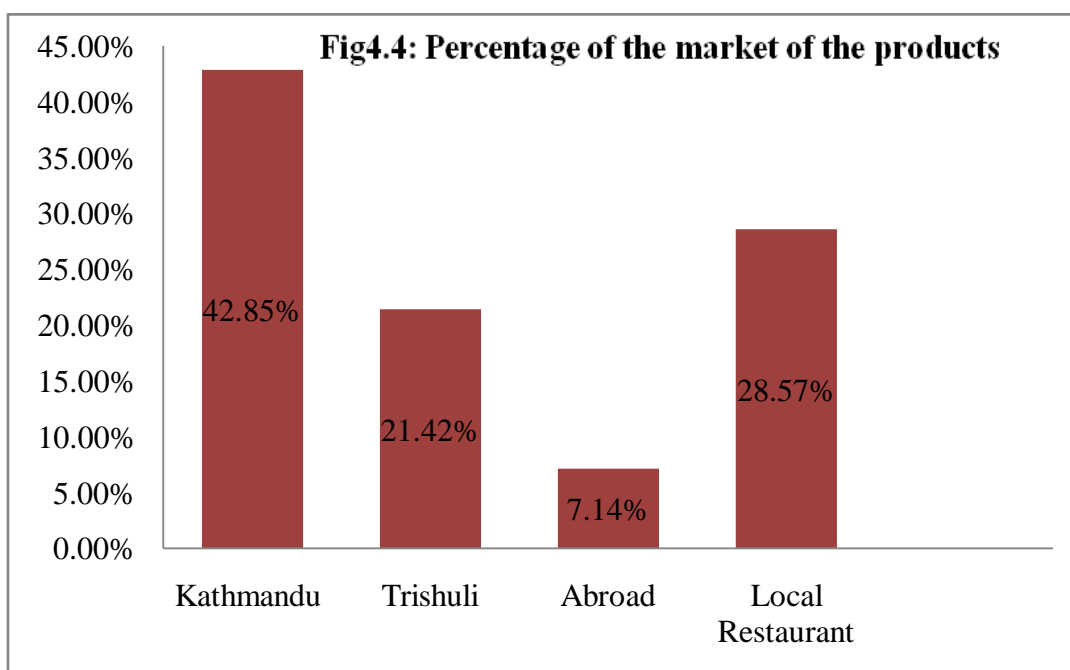
4.2.7 Description of the Market of the Product

The rainbow trout fish has higher market value for its production present production of it hardly covers the demand of Kathmandu valley and production area itself.

Table 4.7: Market of the Product

S.N.	Market of the Product	Number of the Respondents	Percent	Remarks
1	Kathmandu	6	42.85%	
2	Trishuli	3	21.42%	
3	Abroad	1	7.14%	
4	Local Restaurant	4	28.57%	
	Total	14	100%	

Source: Field Survey, 2014



Source: Field Survey, 2014

The market of the production determines the possibility of the higher production. In the context of the study area 50% of the total respondents sell their production in local market i.e. Trishuli the district headquarter and local restaurants. On the other hand 42.85% of the respondents sell their production to Kathmandu and only 7.14% respondents export their production to abroad. The above diagram shows that with easily available market, there is high possibility if rainbow trout fish farming.

4.2.8 Financial Problem in Rainbow Trout Fish Farming

Table 4.8: Financial problem faced by Respondents

S.N	Financial Problems	Number of the Respondents	Percent	Remarks
1	Yes	10	71.42%	
2	No	4	28.57%	
	Total	14	100%	

Source: Field Survey, 2014

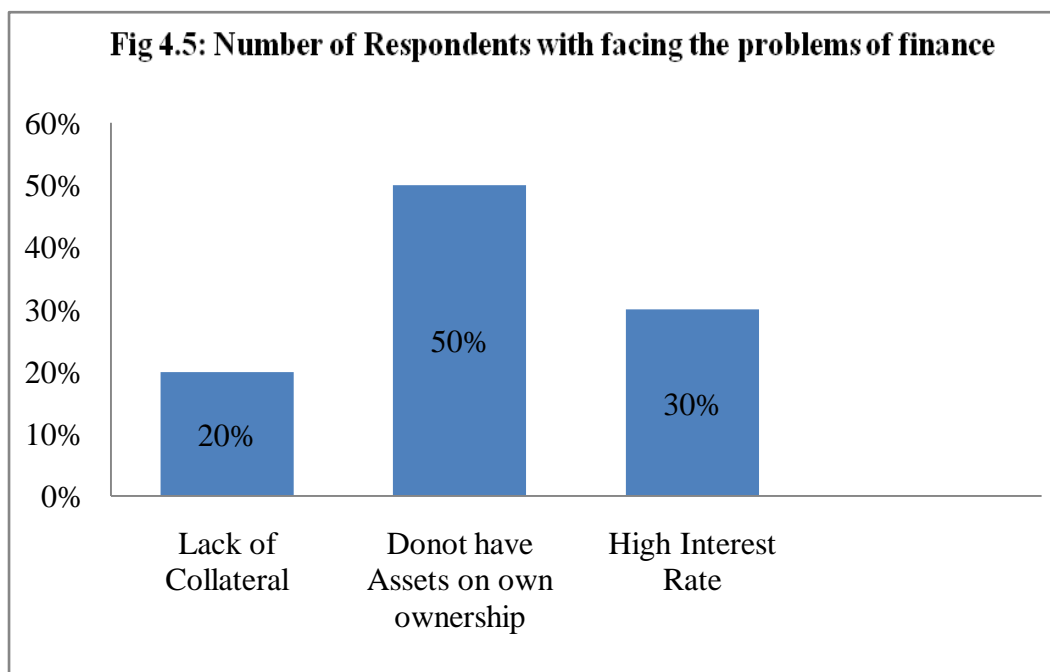
10 out of 14 respondents mentioned that they face the financial problems in rainbow trout fish farming (where as only 4 mentioned that they do not face financial problem). Those who face the financial problems the following are the difficulties they face (shown in the table below).

Table 4.9: Types of Difficulties that the Respondents face

S.N	Financial problem	Number of respondents	Percent	Remarks
1	Lack of Collateral	2	20%	

2	Donot have Assets on own ownership	5	50%	
3	High Interest Rate	3	30%	
	Total	10	100%	

Source: Field Survey,2014



Among the respondents 10 of them said that they do have to face problems in the rainbow trout fish farming. If these groups 20% face the problem of lack of collateral 30% face the problem of high interest rate and 50% of them reported that they face the problem of don't have assets on own ownership.

4.3 General Cost and Benefit situation of Rainbow Trout Farming

The initial fixed cost for establishing and creating the assets and liabilities in a fish farm are generally higher. Investment cost for a trout farms in much higher in comparison with carp projects. This is because more expensive facilities are needed, such as concrete cemented ponds (raceways) and operating equipment. Depreciation should include the land, ponds and other structures in short-term projects, but in the case of Kakani VDC's farm, depreciation has not been calculated for the land because its value usually appreciates.

Variable costs vary with the level of variable cost constitute the main impute used in an aquaculture enterprise. Variable cost vary with the levels of production, where as fixed costs are not affected by pond preparation, fingerlings, feed, electricity, tools, materials and the cost for manpower/labour. Salary, interest on borrowed capital and pay back loan, depreciation of assets (excluding land cost), cost of maintain, telephone/communications and travelling costs are included as the fixed cost. Fixed cost also include the cost of

operating equipments, cost of infrastructure development (i.e. stabilizing the concrete cemented pond etc).

So far there is no thorough financial analysis of the trout production in Nepal. Based on the data collected from the FRS Trishuli and the small scale private sector's farms, some preliminary calculation can be made. Applying the data from the private farm, total costs including total fixed cost and total variable cost. With a cost of about NRs950 to produce 1 kg of trout, which is sold for NRs 1200 per kg. This analysis assumes that fish seed is purchased by the owner and feed made by owner. So, investment cost for the hatchery are not included The cost of fish seed is calculated as the price at FRS Trishuli and cost for transpiration with loading and unloading, cost for electricity and overtime for manpower. The cost of materials tools and labour is lower than the government farm, because the farmer himself is able to handle the farm very well with his family. The analysis lies a profit of NRs 950 per kg of trout fish which gives a rate of return of 49.33 of total cost. The B/C rate of trout farming in Kakani is 2.62 which shows the fisheries project is profitable one (table6).

Table 4.10: Cost and Benefit associated with the Farm

A. Variable cost

SN	Particulars	Quantity	Unit Price (Rs)	Unit	Total (Rs)
1	Feed for table fish	1500	60	Kg	90000
2	Seed of Trout (Fingerlings/Vuras)	21000	10	Rs.	210000
3	Wages			Rs.	86400
4	Glassware/tools/Chemicals			Rs.	20000
5	Farm Fuel			Rs.	30000
6	Electricity			Rs.	40000
7	Marketing Cost			Rs.	95000
8	Others			Rs.	80000
	Subtotal				651400
B. Fixed or Non-operative Cost					
1	Salary for manpower	365	600	man/ day	219000
2	Raceway construction	1	450000	Rs.	450000
3	Water Supply System/pipes	1	27000	Rs.	27000
4	Stores/workshop	1	150000	Rs.	150000
5	Drag net	3	1500	Rs.	4500
6	Netlons/graders/cages/hapes	24	300	Rs.	7200
7	Maintenance Cost	3	27010	Rs.	81030
8	Telephone/ communication			Rs.	12000
9	Gasoline/Travelling			Rs.	120000
	Subtotal				1070730
C. Total Cost= Variable Cost +Fixed Cost					1722130
D. Revenue Collection					
Total Fish Production(10% Mortality Rate)			3240	1200	kg
E.Net Income			Total Revenue -Total Cost		2165870
B/C Ratio			Total Revenue /Total Cost		2.257669

Source: Field Survey, 2014

CHAPTER FIVE

PROBLEM AND PRESENT STATUS OF RAINBOW TROUT FARMING

5.1 Problems of Rainbow Trout Farming

Rainbow trout farming is new innovation in Nepalese economy which was started from a decade ago by the private sector. It is complex and challenging system of farming where fisheries have vital role to transform traditional agriculture and raise the living standard of the people. Rainbow trout fish farming offer a better alternative and greater contribution particularly to the livelihood of the people living in the mountainous region. Despite the great possibility, farmers face the different types of problems during trout farming. Some of them are listed below:

- Lack of insurance of trout fish
- Insufficient capital for investment
- Lack of cold store house and cold water
- Inadequate seed supply and lack of quality feed factory
- Lack of trained human resource in trout extension
- Limited study on demand and supply
- Inadequate marketing channel
- Lack of awareness among local communities

Besides the above mentioned problems there are several problems in cultivation and marketing of Trout Fish. These problems are described below briefly under the following headings.

Flood: The major hindrance in the trout cultivation is flood in rivers and streams during the rainy season. The flood in the rivers and streams cause flow of turbid and impure water in the raceway ponds and consequently this turbid, dirty and impure water negatively affects the health of the fish and sometime even cause death of fish by depletion of dissolved oxygen. Due to turbid water the trout also gets difficult to see the feed properly and grow up very slowly due to less feed intake. Sometime poisonous water flow in the ponds from the streams and this poisonous water kills the fish rapidly. The turbid water also causes the blockage of pipes. During the time of flood, the high current of water also causes the breakage of ponds.

Lack of loan facilities and high interest rate: Trout cultivation requires high initial investment along with high production cost. It is very difficult for the marginal farmers to involve in trout cultivation. The bank doesn't give loan to the farmers who are ready to keep their houses and lands of Trishuli on mortgage. The bank asks for the land of Kathmandu.

Similarly the interest rate is very high that the farmers are getting difficulty in repayment of loan.

Feed: Farmers don't get all the feed ingredients at a place and at the time when required. So, the timely feeding to the trout gets affected. The cost of the feed ingredients and the feed is also getting expensive and the farmers are getting difficulty in the purchase of feed and feed ingredients.

Political instability: During the time of strikes and revolts, the farmers become unable to purchase the required feed and feed ingredients due to which they become unable to feed the trout timely. Similarly, the strikes affect the marketing of trout. They become unable to deliver the trout to those who orders for it. Almost, all the farmers (70%) have their own hotels. They don't get even single customer during the strikes. The shortage of petroleum products also creates problems in the purchase of the materials required for the trout cultivation including timely deliver of the orders.

Disease: The wings and tails of the trout get rotten and the faeces turn yellow. However, these problems are solved by the administration of antibiotics. But sometimes, the medicine given by the government is not effective. It may be due to the inexperienced technicians.

Partiality: Some of the farmers are not getting the subsidy given in the purchase of fingerlings by the government. Similarly, some farmers are also deprived of the economic support provided by the government for the trout breeding.

Lack of cold storage facility: All the produced quantity of the trout gets sold in the market but due to lack of cold storage facility, they cannot harvest the appropriate size of the fish. They have to leave the fish in the pond until gets sold in the market. This leads to the additional feed cost.

The problems encountered by the hotels/ supermarkets/valley cold store are listed below:

- The producers/suppliers are not supplying the trout regularly in the hotels/supermarkets/valley cold store of Kathmandu valley due to which they are unable to serve their customer regularly. The trout is available only in season and the scale of production by the farmers is very low as compared to demand. So, some hotels are in the way to remove the trout dish from the menus.
- The price of the trout is not reasonable and is very high. There is no standard price policy and there is monopoly in fixing the price of the trout. The selling price charged by the big and old farmers is slightly higher than the small and new farmers.
- The producers don't supply the trout of appropriate and uniform size in the hotels. They have to go to the trout farms themselves for getting appropriate size.

5.2 Present Status of Rainbow Trout Farming in Nepal

Rainbow trout culture in Trishuli is being practiced in water coming down from glaciers, where as spring water is used in Godavari station. The area of trout farm at Trishuli is about 2,000 square whereas it is nearly 300 square meter at Godawari. The breeding of rainbow trout was imitated around 1990. The experiment on rainbow trout cultivation started around 1993. At present production technology has been developed and verified in farmers raceways. To date private sector involvement is limited. However, the private farmers are attracted towards trout farming in Nuwakot, Rasuwa, Pokhara and Kavrepalanchowk districts. Number of trout farmers is being increased every year and production is also increasing, which increases employment for the local communities and reduce poverty. Late Mr. Gopal Lama of Kakani VDC-4, Ranipauwa, Nuwakot district is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on the trial basis. Presently, Mr. PurnaBahadur Lama (son of Mr. Gopal Lama) has been growing 40,000 - 70,000 fingerlings of rainbow trout each year in an area 270 square meter (Field survey, 2014).

Total production of trout in Nepal is estimated about 150 metric ton in the year 2014. Where production from private sector contributes 80 percent (120 metric ton).

Table 5.1: Present Status of Rainbow Trout in Nepal

S.N.	District	Production amount (in metric ton annual)
1	Nuwakot	91
2	Lalitpur (Godawari)	7
3	Rasuwa	20
4	Pokhara	22
5	Kavrepalanchowk	10
	Total	150

Field Survey, 2015

5.3 Management Practice of Trout Farming

Trout culture is intensive type of farming which might confronted with environmental issues unless responsible way of culture technique is practiced. Potential sources in trough production requires better gives hence and significant improvement in genetic quality of brood stock for quality seed production, improved feed technology and feed management, reliable diagnosis and effective disease control programs and maintaining hygiene and sanitation of harvested product have led to increases in production efficiencies. Farmers should encourage adopting code of practice for mitigating negative environmental and social impacts. Conductive policy, strong efforts in human resource development to increase researcher capabilities and education program for technical personnel's' as well as farmers are equally important.

CHAPTER SIX

FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 Major Finding of the study

Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in hills and mountains to produce trout wherever adequate fresh cold running water is available.

Agricultural development is a gradual process and an equally challenging sector, whereas fisheries have a vital role to transform traditional agriculture and raise the living standard of people. Fisheries are in an infancy condition in Nepal, which contributes least to the Agricultural Gross Domestic Product. Rainbow trout fish farming is a new innovation in the Nepalese economy, which was started a decade ago by the private sector. Despite the greater possibility, the Nepalese government cannot overwhelm all over to the potential areas.

The main objectives of this study were to diagnose the problem and prospects of trout farming in the Trishuli corridor. For the entire report, we can summarize that there is a great business scope for rainbow trout farming in Kakani of Nuwakot district. Rainbow trout farming is an economically sound and highly profitable business. The B/C ratio of 2.257 for the integrated trout farms shows that trout business is financially sound and its scope is very high, due to which the number of trout farmers has increased to 25 in 2070 B.S. from only 1 farmer in 2054 B.S. The major findings of the study are presented as follows:

- Among 14 respondents, 60 are literate and only 40% are illiterate. The level of education in farmers is satisfactory because it is around the national average.
- Land holding size of the study area has been 183 Ropani. Among 183 Ropani of land, the maximum land is used for cultivation, which was utilized as growing different crops and vegetables, and the small area of land is used for the plantation, which includes different types of trees which absorb the rain water and provide a cooler environment to the raceway for the survival of trout fish.
- 75% of the respondents depend on subsidized income other than agriculture, for which the source of income has been service and business 40% respectively.
- The major inspiring factor for rainbow trout fish farming is high profit and good market availability, which comprises more than 80% of the respondents. The 14.2843% of the respondents believe it as a new innovation to inspire them.

- Total production of trout in Nepal is estimated about 150 metric ton. in the year 2014. Where production from private sector contributes 80 percent where as 20 percent contributes from government sector.
- The value of NPV, BCR and IRR is 2306036, 2.62 and 49.33 percent respectively.

6.2 Conclusion

From the whole report, we can conclude that rainbow trout production is highly profitable business. Though it is profitable, number of farmers involved in trout farming is very little. In Nepal, trout farming has high potentiality. It could have cultivated in cold and running water. The water temperature should be in average range, other content in water should be reasonable amount and improper condition.

Market place for this is big hotels, restaurant, elite group and negligible numbers of local consumers. Marketing channels is very short, so no agent could cloin for the profit margin. Demand on the particular product could be increased highly if consciousness is increased.

Farmers are fully dependent on Rainbow trout marketing for running their life. But they also involves in vegetable farming and other income generating activities. Both educated and uneducated people generating involve in trout farming.

Some enterprises in private sectors are interested in the business. But they are in dilemma, wheatear to start or not due to lack of technical support. Even the famers are in the same condition. So, it can be further expanded if full support is given in this sector. Some NGOs and INGOs involved in this has helped in the growth of the trout farming.

Technical support and financial support to the farmers may enhance the production level of trout fish as well as the productivity. But service from the ADB is very little to the farmers. Feed rate provide by the NARC to the private farmers is very high. It could be minimized to get higher return. If it is lowered, profit itself will rise.

Trout farming is very risky enterprise and required higher investment. The main risk in the trout business is flood which may cause loss of huge amount of money by the death of thousands of fish. However, it can be prevented by high care and management. The price of the trout is high as compared mostly by the rich people. The price can be lowered if the cost of the feed is lowered and the middle class people will also be attracted in the trout consumption. Decrease in the feed cost will also result in the decrease in the investment. In addition to this, easy loan sanction with low interest rate, technical and financial support to the poor and marginalized farmers will stimulate them to get involved in the trout culture; as a result the production volume of the trout will be increased which will help to meet the national demand.

The trout farming is really a powerful weapon to uplift the economic condition of the Kakani, VDC and the persons involved. The government and private sectors should take new place in trout cultivation. The government and private sectors should leave no stone unturned to

produce the trout in large scale to meet the national demand. It may be achieved by providing technical and financial support to the farmers, exploration of the feasible sites, decrease in the cost of feed, easy loan sanction with low interest rate etc.

6.3 Recommendations

After the analysis of the finding the researcher comes up with the some recommendation which have been listed below.

6.3.1 Recommendations for Government Level

- Government should use mass media for trout marketing and promotion with in the country.
- Government must be established hatchery and breeding programme to the farmers.
- Initial matching fund (at least 50 percent of total construction costs) should be provided by the government as a subsidy otherwise farmers cannot bear the whole costs and will not motivated.
- Literacy rate among the respondents found good but all respondents should be made literate and there is a need to provide literacy programme targeting to the rainbow trout fish farming farmers in the study area.
- Implement the rainbow trout fish farming programs and policies to facilitate the rainbow trout fish farming farmers.
- Provide subsidy on rainbow trout fish farming for Vuras (fingerlings) production, to develop of raceways, and equipments for the farmers to expurgate them to apply these inputs for higher production.
- Open a branch of Agriculture Development Bank and other financial institutions in the study area, which could provide loans to the farmers in a cheap interest rate and in a more efficient way.
- Establish the storage center for rainbow trout fish because farmers are facing the problems of storage.

ANNEX I

HOUSEHOLD SURVEY QUESTIONNAIRE

Date _____

1. GENERAL INFORMATION

Name (HHH) :

Village/Tole:

Sex (M/F) :

Type of House:

Age : No

Education:

Cast/Ethnicity:

Occupation:

Land holding:

Annual Income (Rs):

2. INFORMATION ON Rainbow trout fish farming

a. Do you have Rainbow trout fish farming business

a.a How did you know about this business and when you start

b. Do you registered this business? What is the name of your Rainbow trout fish farming?

c. From where do y

ess

d. How much cost did you invest for this business ?

e. Do you think trout farming could be attractive alternative sources of income ?

e.e. How much you earn from one year

f. what kind of problems you face during this business

g. Have you taken lone ?

h. How much time is necessary for this business ?

i . Do you think this busine:

j. Are you satisfied Rainbow trout fish farming business ?

k. What problems are you facing in Rainbow trout fish farming business

8. DO YOU HAVE ANY SUGGESTIONS?

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CHAPTER ONE

INTRODUCTION

1.2 General Background

Rainbow trout was introduced in Nepal from the United Kingdom (UK) and India in late 1960s and early 1970s and reintroduced from Japan in 1988. Rainbow trout is one of the most suitable fish for commercial farming in coldwater. Nepal basically a mountainous country (83% of its area covered by hill and mountain) is known to possess second largest fresh water resources of the world. Trout farming in Nepal exists in two fisheries Research Centers: Trishuli and Godawari. Trout farming can be taken as a typical example of cold-water fish husbandry (Davis 1961, Huet 1992). Its farming success depends upon the types of feed on which one plans to rear them (Chittino 1972) besides amount of water and seed fish (Murayama 1983). Therefore, today it is being cultured at government farms on an experimental basis (Joshi and Western 1995).

Although the indigenous fishes, Asala and kattle are much in demand for their taste, their culture cannot be commercially profitable as their growth is much slower. Therefore, there is a need for fast growing fish species which can be cultured for the establishment of cold – water fishery in country. Rainbow trout, which is most widely cultured all over the world, may be the answer to this question. Realizing the feasibility of trout in cold waters of Nepal, the technology for their breeding and culture has been developed in the fisheries research centers Godawari and Trishuli under NARC.

In Nepal Agriculture sector plays a critical role in the Nepalese economy as this sector still contributes 33.1% which is more than one-third to Nepal's GDP, and more than two-third of its population depend on it for their employment and livelihood (MOF, 2013/2014). Nepal is one of the major countries for having abundant cold freshwater resources in the world; however, these water resources have been poorly used. Rainbow trout being a cold-water fish has high potential to cultivate in Nepal particularly in hilly region where cold water streams prevailed well. People living in the hilly region have less opportunity to increase their income to better their livelihood. Rainbow trout farming could be an important source of their income and providing job to the people living in such regions. Rainbow trout can also support eco-tourism through developing recreational based fisheries for fishing opportunities to tourists in hill streams. However, effort on that direction is required. Trout farming has bright prospects for expansion as Nepal is rich in cold water resources from east to west in the hilly region.

The cultivation of Rainbow trout farming is the new special programme on agriculture sector which can help uplift the society and nation. Fishery is promising, small but important sector of agriculture in Nepal. It contributes about 2-3% to agricultural gross domestic production and less than 0.5% contributes to gross domestic production (MOF, 2013/14).

Rainbow trout is one of the best known fish for commercial farming in cold waters. The flesh of trout is considered high quality products because of its specific composition, which

supports healthy cardiac function and memory sharpening . The commercial cultivation of trout was started as early as in 1853 in USA (Bardach,1972).

Trout is high value, exportable agricultural commodity consumed in urban area by resource rich people, however, efforts are needed to make the trout available to everyone. Earlier about two decades back in Nepal chicken is also considered as rich person food, however, presently chicken meat are sporadically available regardless of urban and rural area.

Cold water fish culture in the mid hills is at the very beginnings although a few ventures show that it is a profitable enterprise. Rainbow trout is the best suited exotic fish for growing commercially in mid hills of Nepal. The culture technology and seed of rainbow trout are available in the country.

Rainbow trout could not survive due to the lack of technical know-how and was re-introduced from Japan in 1988. During this period, the Nepal Agricultural Research Council developed the breeding and culture technology for this species. Rainbow trout is a carnivorous species which requires high protein feed and well oxygenated water. In nature it feeds on aquatic insects, small crustaceans and small fish. It can be cultured using artificial feed of no less than 20 to 30 percent of animal protein.

Rainbow trout is able to live within a temperature range of 0-25°C and it grows at the water temperature range of 10-20°C. The fish reaches commercial size (300-400 g) during the second year (Huet,1975). In Trishuli, Nepal, it reaches 300-400 g within 14-months from the free-swimming larval stage (FRS, Trishuli), depending on the quality of the feed, adequate supply of water of suitable quality, including a suitable temperature and dissolved oxygen concentration. Rainbow trout was bred for the first time in Nepal in 1990 and its culture was initiated experimentally in 1993. Present trout production is more than 30 metric tons annually from two government stations, and about 110-120 metric tons from the private sector. Mr.PurnaBahadur Lama from Kakani Village Development Committee-4 of Nuwakot District is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on a trial basis. Presently, he has been growing 40,000-60,000 fingerlings of rainbow trout each year in an area of 620 m².

Two Fisheries Research Stations, Godawari and Trishuli, under the Nepal Agricultural Research Council (NARC) are raising rainbow trout from eggs to adults and vice versa. Both stations are culturing the fish in concrete raceway ponds. As a source of water, spring water at Godawari and river (glacier and snow melt) water at Trishuli are used. The total area of ponds for trout culture at Godawari is nearly 300m². Trishuli station has about 1150m² has been used for grow-out fish and the rest for breedstock of trout as well as for native fish species.

Presently, 25 private farmers from Kakani, Nuwakot district has been involved in trout farming . This is a positive sign in the development of trout aquaculture entrepreneurship. They can produce 90-91 metric tons of trout annually under present conditions.

1.2 Statement of the Problems

Rainbow trout fish farming is one of the promising industries related to agriculture sector. Rainbow trout fishing is a newly introduced species is gaining its popularity as sport and food value fish. Lack of adequate capital, difficulties regarding the development of infrastructure, lack of practical knowledge for its production, in sufficient assistance from government are the serious problems that might discourage the farmers who are eager for trout farming. Due to lack of proper technical knowledge and being a cool -water species its production in our country is very limited which has made it fairly costly and probably limited to certain hotels, restaurants, and some of the diplomatic offices in Katmandu. Thus, this particular species which is being cultured here on an experimental basis, holds a greater future potential and the successful culture of it will surely contribute a great deal towards import substitution and export promotion generating foreign currency. Therefore, the study is concentrated to find the answer of the following question

4. What is the Present status of rainbow trout farming in Trishuli corridor?
5. What are the Problem of this farming ?
6. What are the role of trout farming in to uplift the living standard of farming ?

1.3 Objectives of the Study

The main objectives of this study is to diagnose the problem and prospects of trout farming in Trishuli corridor.

The specific objectives of the study are stated as below:

4. To analyze the present statu of trout farming in Trishuli corridor. .
5. To find out the specific problem of this farming .
6. To assess economic role of this farmings in Nuwoko district .

1.4 Importance of the Study

It is believed that present study would diagnose the problem and prospects of trout farming in in Trishuli corridor. Therefore the significance of the study aims to find problems and prospects of trout farming. It could also be beneficial to policy makers to formulate appropriate policy.

1.5 Limitations of the Study

- This study was limited on the boundary of trout farming in Trishuli corridor at kakani in Nuwakot district.
- This study has been done in nuwakot district only so that it was not represent the condition of other district

1.6 Organization of the Study

The study is organized in order to six chapters. First chapter provides introductory information which includes background of the study, statement of problems, objectives of the study, and limitations of the study. Second chapter present literature review that describes about the concept of cost and benefit analysis of rainbow trout fish farming success story of rainbow trout fish farming in national and international level and the review of previous studies. The third chapter relates to the research methodology that describes research design, study area and rational for its selection, nature and sources of data, the universe and sample, technique and tools of data collection and data analysis interpretation. Fourth chapter describes presentation and analysis of data. Fifth chapter presents the issues and present status of rainbow trout fish farming and the sixth chapter presents the summary of the finding, conclusion and recommendation of the study.

CHAPTER TWO

LITERATURE REVIEW

Rainbow trout was first introduced in Nepal in the late 1960s and early 1970s from the United Kingdom, Japan and India, and was re-introduced from Japan in 1988. Now the breeding and culture technology of rainbow trout is well developed.

According to Swar DeepBahadur in 1999, on the basis of available reports which fishery is small but important sector of agriculture in Nepal. It contributes about 1.75% to agricultural gross domestic production. Cool and cold water streams and rivers in Nepal extending from the Himalayas offer excellent habitat to 76 native (Rajbansi 2002) and 3 exotic cold water species (including Brown trout and Among Trout Perhaps do not exist in Nepal, and Rainbow trout). The native cold water fisheries sources offers vast scope for development of cold water aquaculture, however, at present this sector is predominant by subsistence and recreational fisheries only. Cold water native species for their aquaculture promotion is still in its infancy. It is only few indigenous species that have been domesticated and propagated for cultivation purposes. Their culture has yet to be adopted by the private sectors. Among the exotic species, rainbow trout cultivated cold water salmonid throughout the temperate world (Bardach et al. 1972). In Nepal, its farming practices has recently been started to adopted (Rana 2007)

Rainbow trout culture in Trishuli is being practiced in water coming down from glaciers, where as spring water is used in Godawari Station. The area of trout farm at Trishuli is about 2,000 Sqm where as it is nearly 300 Sqm at Godawari. The breeding of rainbow trout was initiated around 1990. The experiment on rainbow trout cultivation started around 1993. At present, production technology has been developed and verified in farmers' raceways. To date private sector involvement is limited. However, the private farmers are attracted towards trout farming in Nuwakot and Rasuwa district. Number of trout farmers is being increased every year and production is also increasing. Mr. Purna Bahadure lama (Mr. Gopal lama) of kakani VDC-4, Ranipauwa, Nuwakot District is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on the trial basis. Presently he has been growing 10,000-20,000 fingerlings of rainbow trout each year in an area of 136 Sqm (Nepal . 2002).

Total production of trout in Nepal is estimated about 17 mt in the year 2006 is where production from private sector contributes 60 percent, However, total annual fish production in Nepal is estimated to be 42,463 mt, of which captured fisher accounted about 47 percent Majority of the production came from private sector. At present annual trout production in Nepal ranged between 10-15 mt. Trout production in Nepal in 1993 was about 318 kg which was 1565 kg in 2005.

Rai (2002), Economic analysis shows the cost benefit analysis of trout farming based on the case of a private farm of Nepal . The present farm get price of per kg trout is 350 NRs. The price could go up to 650 NRs depending upon the demand (season) and size of the fish. Smaller trout can be sold at higher prices. As there are limited farms, people visit these private trout farms and farmers cook and sell their trout to them on the farm. If there is low

demand, farmers can smoke their trout and keep it for longer periods or send it to nearby towns as well. Cooked trout can be sold at 25-30 percent higher prices.

The impressive net profit of annual rate of returns (40 percent), returns on investment (56 percent) and gross margin (66 percent) should be the attraction for more private farmers to adopt trout farming. As feed cost is nearly half (47 percent) of the total cost of production and this cost could be reduced to (30 percent), there is still room to increase the profit margin if a cheaper feed, using locally available resources, could be formulated through research.

According to Poudyal (2003), Fisheries sector is becoming one of the potential activities in Nuwakot district. Some of the farmers of Nuwakot district have initiated this business; however, their economic enhancement has yet to be traced. The study to find out the economic enhancement of the farmers involved in exotic cold water fish (*Onchorhynchus mykiss*) was conducted at potential areas of Nuwakot district where only four farmers were found to be involved in these areas. The benefit cost ratio of those farms business was ranged from 1.024 to 1.66. It might be due to high cost for the feed which made production cost high. The cost of production of government farm was about NRs 170 per kg but at farmer level it was about 250 per kg. The selling price of the trout was about NRS 300-600 per kg depending on the time and consumer type. Trout cultivation has wide scope within as well as outside the country. Neighboring countries like India, Pakistan, Bangladesh, Thailand and China have wide demand for it. Though the main market of the trout is not well specified, big hotels and restaurants and some of the diplomatic groups with high income level can purchase. Marketing channel of this fish business was found very simple, that is, producer to consumer without any intermediaries. Transportation system is so simple since fresh meat is consumed and it is transported through local vehicles by packing in the plastic crate with ice. Through the study it can be said that there is immense scope of enhancing economic level of the farmers through trout business if the farmers are provided with loan facility, Technical backstopping and related inputs.

Basnet (2005), Trout farming has become successful in Nepal after more than a decade of continuous and enterprising efforts. It generates not only the income to the farmers but also creates employment opportunities to the people living in the mountainous and hilly region. In addition, it has potential to be exported overseas and earn foreign currency. Rainbow trout can also attract internal tourists and provides fresh fish in restaurants as well. In order to expand the industry, government should initiate and take interest support providing subsidizing as well as technical support. Eco-geographically and Socio-economically there is higher scope of farm establishment throughout the country especially in mid and high hills. Integrated trout farmers have demonstrated that trout integration can increase the farm land productivity by 12 times higher than the traditional farming. In several other locations this kind of farms could be developed where trout can be integrated with other commodities. This type of integrated approach would indeed enhance farm land productivity several fold for livelihood enhancement and poverty alleviation of hill farmers.

Khanal and Gautam (2007), Rainbow trout farming practice is expected to have high potentiality to be scaled up in mid hill and mountainous region of Nepal. Despite of its

potentiality, the farming is restricted only to a very few farmers of Nuwakot district. Successful trout farming demands high hills, expertise and specific managerial requirements which might pose problems to find our appropriate site for trout farming it might to be the reason that some of the trout farmers have perceived trout farming the trout farming activities in present in present socio-economic perspectives a schedule interview in Nuwakot district was performed. High demand of trout with the lucrative market price the trout farming a viable enterprise in the mountains and hills of Nepal. Possibility to utilize abundant sloppy land, natural spring water, link with hotel business and agro tourism were the potentialities realized for rapid scaling up of trout and production cost, difficulties in availability for fish fry, technical aspects of farming, high starting and production costs difficulties in availability of feed were considered the major constraints for scaling up of trout farming technology at farmers mostly prefer easier provision of financial support with low interest rate and appropriate valuation of their trout farming lands for loan sanctioning Intensive technical trainings for starter farmers, effective mechanism for availability of fry fish and group approach in feed management are some recommendations of farmers on scaling up of rainbow trout farming to the similar areas within the country.

Gurung, (2008), Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in Hills and Mountains to produce trout whether adequate fresh cold running water is available. The economic context is encouraging for trout farming in Nepal. Both men and women can contribute in various levels of production and marketing activities. Technology is not a major problem but promotion of these technologies in farmer's field in suitable agro-ecological reasons is urgently required. Trout farming has been carried out in the marginal land, since trout farming utilizes marginal land, therefore, from scaling-up perspectives it seems high potential for trout commercial production. With the minimum investment in the trout, the farmers can earn more income so it is more beneficial for the farmers. Currently there is a small production and small-scale marketing system which mean that generally trout can only be sold in the area closed to the trout farms and around Kathmandu valley. There is some sale to few star hotels, restaurants and stores in Kathmandu, but demand is very high and most hotels asked to supply trout products from farms because they require high quality processed products. Many wealthy people belonging to do family visited the trout farm for recreation and taste trout in farmer's restaurants. They even can enjoy the trout harvesting by themselves in farmers ponds. This situation provides a healthy business atmosphere and in reality it has a multiplying effect on the economic condition of the rural people because both are owner and non-owner derives income from the same area.

High demand of rainbow trout and good return to the farmers in the study area indicates the potentiality of scaling-up rainbow trout in those areas where technical and managerial aspects of trout farming is met. Integrated approach of trout farming associated with hotel business seems to be more profitable. Intensive technical backstopping for the trout growers and frequent visits from technicians in the farming areas could help in minimizing technical difficulties encountered by the trout growers. Government need to formulated appropriate mechanism for easy and adequate availability of fry fish to the farmers. Farmer's group approach in feed management could solve the availability and high cost of

feed. Moreover, promotion of cooperative concept by federating the interested trout farmers in the potential areas.

Trout farming is not profitable and feasible for the subsistence farming. For the profitable trout farming, initial investment is comparatively high which cannot be afforded by many small and medium scale farmers of Nepal. Easy access to the soft loan for establishment of the trout enterprises is the must to promote the trout farming at commercial level. The sloping land used for rainbow trout farming should be valued as part of trout enterprises and thus valuation while sanctioning loan should be done accordingly. By adopting integrating approach of fish farming, generating electricity, running the water mills and using the drained water from the pond for irrigating the high value agriculture crops, trout farming could be made more inclusive to the community members. The use of the drained water from the ponds for the high value crops growers, relatively poor member of the community who cannot afford the trout farming, would also promote the social inclusion process. This will also help justifying the public financial institutions, e.g., agricultural development banks, that the money is invested or the benefit of all kinds of the farmers including the poor members.

Karki (2013) the largest cost item in rainbow trout farming is capital cost including construction of raceway, 24 hour running water supply system, store house; and procurement of nets, grader and related equipments. It was estimated that about Rs 876 thousand was required to construct 200 m² concrete raceways and water supply system in 2012. Similarly, construction of store and guard house required Rs 181 thousand. Another 37 thousand was estimated for procurement of different types of net and related equipments. Among the operating costs, feed is the most important item accounting for about 48% of total operating costs. Other major cost items are interest on credit, remuneration of human resources including manager and labor/security guard, depreciation of capital items, procurement of small equipment/utensils and utilities. The cost benefit analysis shows that total annual operating cost of an average farm is about Rs 1.5 million whereas value of production is Rs 1.9 million meaning that an average farm of 200 M² raceway can earn a net profit of Rs 380 thousand per annum. In terms of a per kilogram of fish production, cost was Rs 598 whereas average farm gate price was Rs 750 in November 2012, resulting in to a profit of Rs 152 per kg of rainbow trout production. The question is “why there is no production boom if the business is relatively lucrative?” The major reason given by the stakeholders was that entrepreneurs often hesitate to invest in this business for two reasons: first, initial cost is very high and second that high fry mortality was experienced in some of the cases in the past.

Producers are found to have largest share in profit from rainbow trout value chain, followed by wholesaler/retailers. This is justified as a farmer has to spend as much as Rs 598 per kg production and has to wait 12-14 months for the fish to gain average weight of 200 gram. Producers are found to have largest share in profit from rainbow trout value chain, followed by wholesaler/retailers. This is justified as a farmer has to

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The cost benefit analysis shows that total annual operating cost of an average farm of 200 M² raceway is about Rs 1.5 million whereas value of production is Rs 1.9 million meaning that an average farm can earn a net profit of Rs 380 thousand per annum. In terms of per kilogram of fish production, cost was Rs 598 whereas average farm gate price was Rs 750, resulting in to a profit of Rs 152 per kg of rainbow trout production to producers. The average cost of handling and packaging is Rs 25 per kg, cost of transportation Rs 20 per kg and cost of weight loss & others Rs 25 per kg. This adds up to Rs 820 per kg when it reaches to urban centers. However, retail price in Kathmandu and Pokhara during the survey period was recorded from Rs 950 to 1000 per kg, meaning that profit margin to traders was Rs 130 per kg of the product sold. The present profit margins of producers to traders show that there is enough space to improve the value chain efficiency. The value chain of rainbow trout is small and simple. Basically, it starts from suppliers of seed and feed. Initially Nepal Agricultural Research Council (NARC) used to supply brood fish to hatchery. Now those hatcheries have been selecting and maintaining brood stock. They produce and supply fry to their own farm as well as to other farms. Similarly, several rainbow trout farms produce feed for their own farm and also supply to other farmers. On-farm testing of rainbow trout at individual farmers' own management conditions and its economic analysis indicates that trout farming is technically feasible and profitable in places where suitable agro ecological conditions prevail. Major factors that provide high potentials of increasing rainbow trout fish in Nepal include several rivers originating from the Himalayas and flowing through the hills, sloping lands with poor fertility status that have low opportunity cost, very high rate of return on investment, high demand and ever increasing prices, scope of product diversification and multiple use of water resource.

The growth of rainbow trout culture in Nepal has been large. Production in 1993, when research on full-scale operation initiated, amounted to 0.318 Mt, and by 2006, production reports ranged from 12-17 Mt (Rai et al., 2008; Swar, 2007). While Swar (2007) attributes 60% of current rainbow trout production to private operations, Thakur et al. (2008) argues that this figure is closer to 75%. The first private operation was conducted on a trial basis by a single farmer in 1998 (Swar, 2007). As of Rai et al.'s 2008 report, there were 12 rainbow trout operations in the private sector; of which, ten were deemed profitable. A total rearing unit surface area of 1270 m², with an average of 15-20 kg/m²/year, resulted in a total production of 12 Mt in 2006 (Rai et al., 2008). Though still considered limited, the private sector's contribution to the Nepalese rainbow trout's industry is expected to grow (Swar, 2007)

CHAPTER THREE

RESEARCH METHODOLOGY

Research Methodology

This chapter deals about sets of methods which were employed in this study.

3.1 Research Design

This research had adopted exploratory and descriptive research design. It was exploratory in the sense that in contrast to deductive approach, it tried to explore and explain the phenomenon by accumulating primary data and building casual relationship between the variables. The historical and other references were also taken for assistance of the micro level. In order to fulfill the objectives, information has been collected from the Household survey, informal meeting, focus group discussion, key informant interview and observations which were the main techniques that have been used to obtain the information.

3.2 Nature and Sources of Data

Both primary and secondary information sources are used for the fulfillment to the objective of the study. The study is basically based on field survey where as secondary sources of information were used from the relevant sources. Primary data was collected through questionnaire, interviews and observation method. So, the information and data collected are both of qualitative and quantitative in nature.

3.3 Methods of primary Data Collection

3.3.1 Household Survey

Interview schedule was designed for the collection of data. Structured, unstructured and open ended question was prepared to seek the information on various aspects of the study. Interview schedule was field visiting the particular study area.

3.3.2 Sampling Design

The data is both qualitative and quantitative in nature. A simple random sampling method was applied during the primary data collection for household survey. 14 population samples of farms were selected from 25 farms (56%) by lottery method. For simple random sampling, the population list was obtained from the study area. After gathering the household information, lottery method was applied.

3.3.3 Questionnaire

Questionnaire for Household, Hotels and Supermarkets were prepared for the collection of the data of the study area. Closed questions were included for getting the information of the

topic. The local rainbow trout fish farming farmer of the particular study area were requested to fill up the questionnaire.

3.3.4 Observation

Observation method was also used to obtain the information. Each farm selected in sampling was visited. The socio-economic status of the rainbow trout fish farming farmers was observed and the data were recorded.

3.4 Methods of Analysis

As discussed above, the data were collected through various sources using various data collection techniques and tools. The data were scientifically processed with the help of computer program, formulaic method and descriptive way. After editing, coding and tabulation of the data, the conclusion was drawn for the presentation through different types of tables, charts and figures.

CHAPTER FOUR PRESENTATION AND ANALYSIS OF DATA

4.1 Introduction of Site

Kakani VDC was selected for the study. This village is 27 km north-west from Kathmandu and about 43 km South-east from district headquarter. The village is linked by motor able road from PasangLhamu Highway. The village is famous for strawberry farming, rainbow trout fish farming and a best place for picnic sport. There is international Mountaineer Memorial park also. It is a touristic place which is famous for cycling, site seeing and so on.

Kakani VDC is situated at the elevation level of 2000m from the sea level. The village comprises hills on east, west and south and north with the beautify site seeing of Himalayas. It extends approximately 7 km east to west and 6 km north to south. The political boundaries of Kakani VDC include on its Eastern side Thanapati VDC, on its Western side Madanpur and Chaturale VDC on its Northern side Thansing VDC and on its Southern side Okharapauwa VDC. The VDC has mountaineers Memory Park on the east, Pasang

Lhamu highway on north-west and so on. The Syaule Khola and Dovan are the major sources for water for trout farming in the study area.

Kakani VDC has been divided into nine wards and each ward included two to four hamlets or toles. There is one higher secondary school, one primary Health Center and International Buddhist Library too.

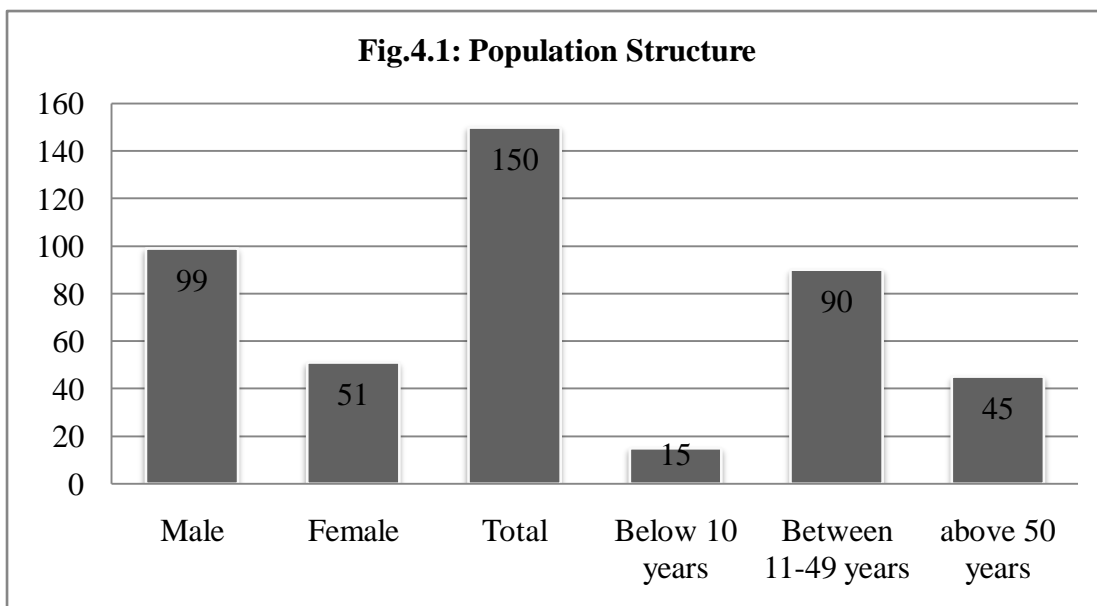
According to the census of 2011 (2068 BS) the total population of Kakani VDC is 7604. Among the total population 3761 are male and 3843 are female. The majority of the people are Tamang with representation of 65.65% the total population. There are 1396 households among them 25 household has adopted commercial rainbow trout fish farming as their occupation. Among the total population 80% people are involved in agriculture activities while 45% people are below the poverty line of total rainbow trout fish farming farmers 14 household have been selected as primary respondents for the purpose of the study.

4.2 Socio-economic Profile of Respondents

Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in hills and mountains to produce trout wherever adequate fresh cold running water is available. The socio-economic context is encouraging for trout farming in Nepal. Both men and women can contribute in various levels of production and marketing activities. Technology is not a major problem but promotion of these technologies in farmers field in suitable agro ecological regions is urgently required. Trout farming has been carried out in the marginal land. Since trout farming vitalizes marginal land, therefore, from scaling-up perspective it seems high potential for trout commercial production. Currently, there is a small production and small-scale marketing system which means that generally trout can only be sold in the area close to the trout farms and around Kathmandu valley. There is a some sale to few star hotels, restaurants and stores in Kathmandu, but demand is very high and most totals asked to supply trout products from farms because they require high quality processed products. many wealth people belonging to do family visited the trout farm for recreation and taste trout in farmer's restaurants. They even can enjoy the trout harvesting by themselves in farmers pond. This situation provides a healthy business atmosphere and in reality it has a multiplying effect on the economic condition of the rural people because both the owner and non-owner derive income from the same area.

4.2.1 Population Structure

During questionnaire survey, question related to the households size, gender and age group was asked to the available respondents of the family. The population was categorized into three age groups, below 10 years, between 11 to 49 years and above 50 years on the basis of their contribution to the trout fish farming. The population of trout famers was 150 as shown in figure 4.1.



Source: Field Survey, 2014

Population of male was more (99) comparing to the population of female (51) in the studied trout farming. This proves the social as well as economic status of the farmers according to gender perspective and most of the respondents were male because of opportunity to involve in activities which is out of household area. The female are still within the boundaries of four wall of the house. This is because male were out of their home for their education, work and training than the female people of age between 11-49 years were able to work in the trout farm easily and help their family for generating income more than 60% people were able to work hard and got benefit from trout farm.

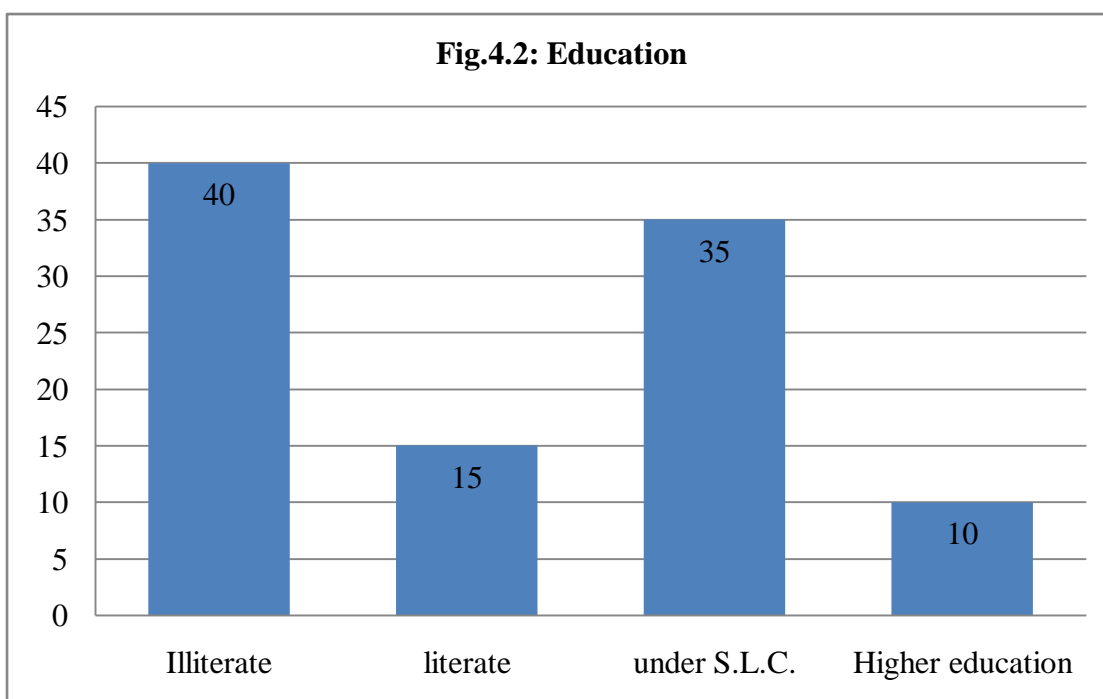
4.2.2 Education

Table 4.1 Education Status of Respondents

S.N.	Education Level	Number of Respondents	Percent	Remarks
1	Illiterate	3	40%	
2	Literate	5	15%	
3	Under SLC	4	35%	
4	Higher Education	2	10%	
	Total	14	100%	

Source: Field Survey, 2014

Question related to education was asked to the respondents. For different categories of education as shown in figure were constructed. Among the respondents, there were 60% people literate and 40% people illiterate as shown in figure 4.2.



Source: Field Survey, 2014

The literacy role of the respondents was less than the national literacy rate of population 65.9% (CBS, 2011). There were very less people pursuing higher education. Many people were unable to pass the SLC examination. Literacy rate of young children was higher and old people were low as old people were deprived of education in the past time. It shows that, more people are available in household and they also limiting to involve in rainbow trout fish faring strategy marking.

4.2.3 Land Holding Size of Respondents

During questionnaire survey, question related to land holding status was asked to the respondent. Bush/shrub, grass, ponds/lakes, sandy area, waste and barren land and water bodies were selected to be included in the study. Table 4.1, shows the various land use/lands cover of the study area.

Table 4.2: Land Holding Size of Respondents

Description	Area (Ropani)	Percentage (%)
Bush/shrub land	5	2.73
Cultivated land	40	21.86
Forest land	25	13.66
Grass land	20	10.93
Orchard/nursery	10	5.46
Plantation	3	1.64
Ponds/lake	5	2.73
Rock	35	19.13
Sandy area	5	2.73
Waste and barren land	25	13.66
Water bodies	10	5.46
Total	183	100.00

Source: Field Survey, 2014

The above data shows that, the maximum land is used for cultivation which were utilize as growing different crops and vegetables and the smallest area of land is use for the plantation which include different types of tress, which absolve the rain water and provides the cooler environment to the raceway for the survival of trout fish.

4.2.4 Livestock Kept in the Hoses of Respondents

Table 4.3: Livestock kept in the houses of Respondents

S.N.	Live stock	Number of Animals	Percent of the live stock	Number of Respondents	Remarks
1	Cows	8	7.69	2	
2	Buffalo	9	8.65	4	
3	Goats	33	31.73	3	
4	Chicken	54	51.93	5	
5	Others	0	00	0	
	Total	104	100.00	14	

Sources: Field Survey, 2014

Livestock is an integral part of agriculture. Livestock and agriculture have direct inter-linkages because livestock is a means of food and fertilizer is animal dung which is also the major sources of biomass energy. For this reasons, keeping livestock is a must for the peasants. On the other hand, the unused green pants and herbs are ultimate food for their animals and they require to keep animals for using or utilizing the byproducts of agriculture. Though the concerned governmental agencies and NGO's have been promoting fodder tree plantation but because of inadequate education and lack necessary technical expertise, it is not as common as expected. a similarly, in Kakani village as well people traditionally keep

livestock for agricultural purpose but for commercial purpose. This also determines the status of the family in rural context.

4.2.5 Occupation of the Respondents Beyond Rainbow Trout Fish Farming

Most of the people of the study area are occupying in agricultures their main source of livelihood. Rainbow trout fish farming is adopted commercially in Kakani form a decade age. Only aspect of the household of the study area. This area is dominantly depends on the agricultural activities. So, almost all people involve in another occupational part of the society. The involvement of farmers in other activities rather than agriculture is another part of socio-economy which reflects the living standard of the respondents.

Table 4.4: Other occupation of the Respondents

S.N.	Involvement in another occupation	Number of respondents	Percent	Remarks
1	Yes	10	75	
2	No	4	25	
	Total	14	100.00	

Source: Field survey, 2014

Table 4.5: Other Occupation held by Respondents

S.N.	Occupation	Number of Respondents	Percent	Remarks
1	Job	4	40	
2	Business	4	40	
3	Agricultural activities	2	20	
4	Others	0	00.00	
	Total	10	100.00	

Sources: Field Survey, 2014

Among the total respondents who involved in another occupation activities along with rainbow trout fish farming 40% has their own business, 40% have service and 20% involve in another agricultural activities.

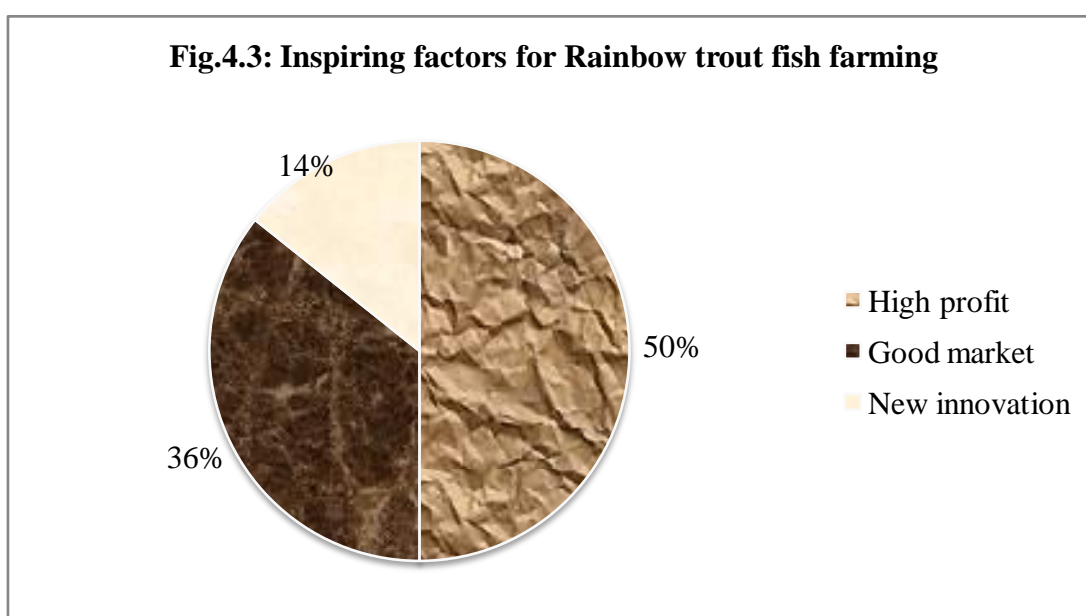
4.2.6 Inspiring Factors for Rainbow Trout Fish Farming

For doing the new things there is need of believers and inspiring to do it. Being a new innovation in Nepalese fisheries industry rainbow trout fish farming has become the promissory farming for the farmers which the priority to the government sector too.

Table 4.6: Inspiring factors of Rainbow Trout Fish Farming

S.N.	Factors of Inspiration	Number of Respondents	Percent	Remarks
1	High Profit	7	50%	
2	Good Market	5	35.7157%	
3	New innovation	2	14.2843%	
	Total	14	100%	

Source: Field Survey, 2014



Sources: Field Survey, 2014

The diagram shows that major inspiring factor of the rainbow trout fish farming to get high profit where 50% of the respondents answered it 35.72% respondents believe that there is good market for their production and 14.28% believe it as the new innovation to transform their livelihood to betterment.

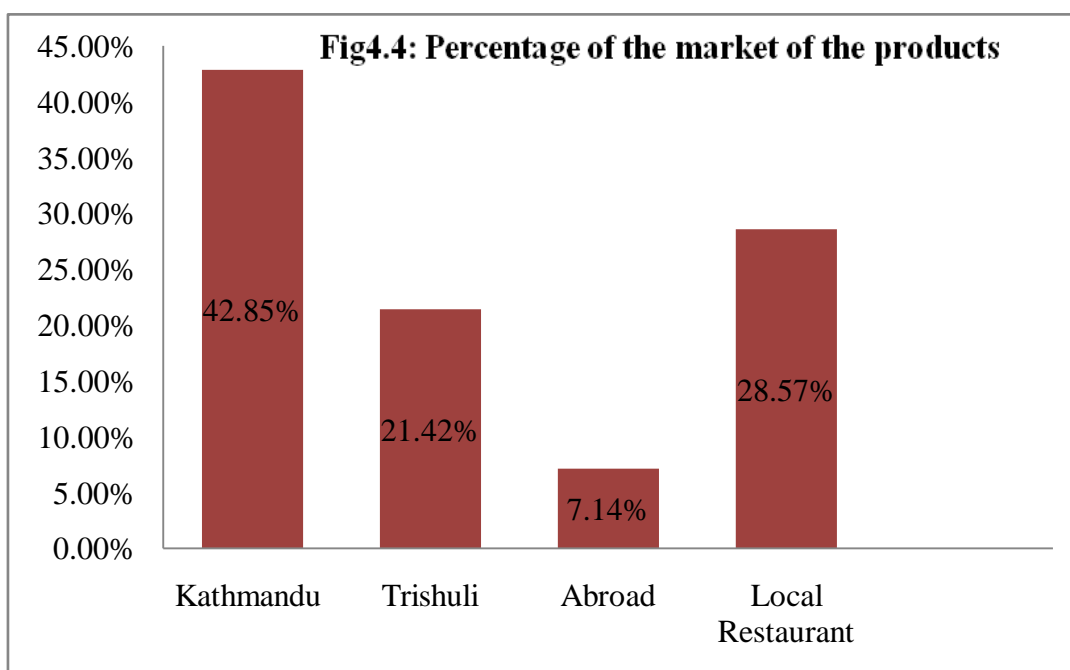
4.2.7 Description of the Market of the Product

The rainbow trout fish has higher market value for its production present production of it hardly covers the demand of Kathmandu valley and production area itself.

Table 4.7: Market of the Product

S.N.	Market of the Product	Number of the Respondents	Percent	Remarks
1	Kathmandu	6	42.85%	
2	Trishuli	3	21.42%	
3	Abroad	1	7.14%	
4	Local Restaurant	4	28.57%	
	Total	14	100%	

Source: Field Survey, 2014



Source: Field Survey, 2014

The market of the production determines the possibility of the higher production. In the context of the study area 50% of the total respondents sell their production in local market i.e. Trishuli the district headquarter and local restaurants. On the other hand 42.85% of the respondents sell their production to Kathmandu and only 7.14% respondents export their production to abroad. The above diagram shows that with easily available market, there is high possibility if rainbow trout fish farming.

4.2.8 Financial Problem in Rainbow Trout Fish Farming

Table 4.8: Financial problem faced by Respondents

S.N	Financial Problems	Number of the Respondents	Percent	Remarks
1	Yes	10	71.42%	
2	No	4	28.57%	
	Total	14	100%	

Source: Field Survey, 2014

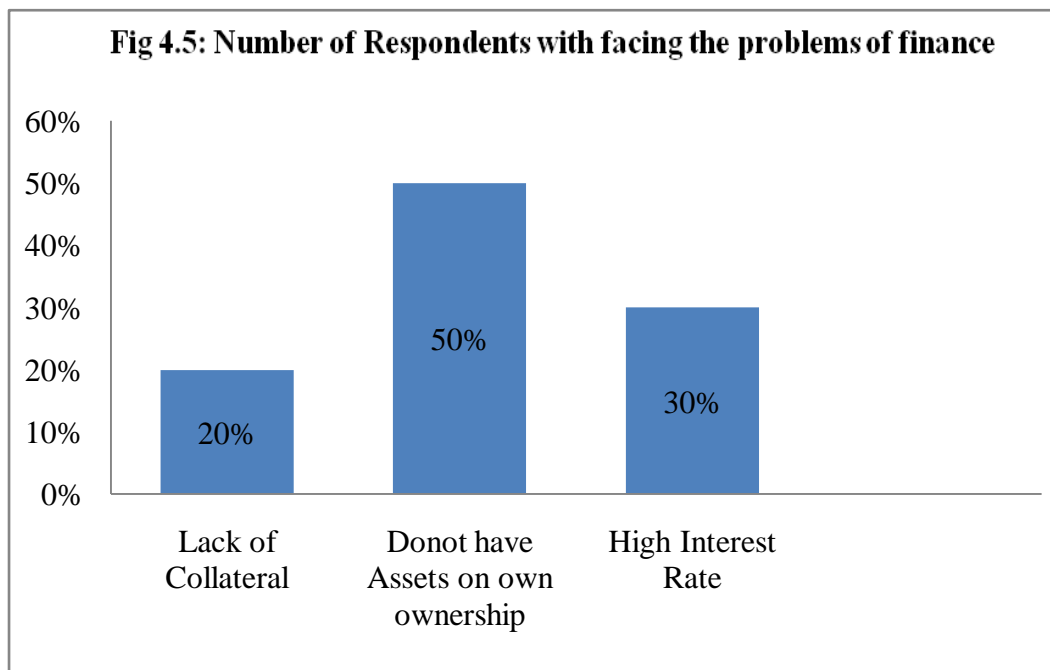
10 out of 14 respondents mentioned that they face the financial problems in rainbow trout fish farming (where as only 4 mentioned that they do not face financial problem). Those who face the financial problems the following are the difficulties they face (shown in the table below).

Table 4.9: Types of Difficulties that the Respondents face

S.N	Financial problem	Number of respondents	Percent	Remarks
1	Lack of Collateral	2	20%	

2	Donot have Assets on own ownership	5	50%	
3	High Interest Rate	3	30%	
	Total	10	100%	

Source: Field Survey,2014



Among the respondents 10 of them said that they do have to face problems in the rainbow trout fish farming. If these groups 20% face the problem of lack of collateral 30% face the problem of high interest rate and 50% of them reported that they face the problem of don't have assets on own ownership.

4.3 General Cost and Benefit situation of Rainbow Trout Farming

The initial fixed cost for establishing and creating the assets and liabilities in a fish farm are generally higher. Investment cost for a trout farms in much higher in comparison with carp projects. This is because more expensive facilities are needed, such as concrete cemented ponds (raceways) and operating equipment. Depreciation should include the land, ponds and other structures in short-term projects, but in the case of Kakani VDC's farm, depreciation has not been calculated for the land because its value usually appreciates.

Variable costs vary with the level of variable cost constitute the main impute used in an aquaculture enterprise. Variable cost vary with the levels of production, where as fixed costs are not affected by pond preparation, fingerlings, feed, electricity, tools, materials and the cost for manpower/labour. Salary, interest on borrowed capital and pay back loan, depreciation of assets (excluding land cost), cost of maintain, telephone/communications and travelling costs are included as the fixed cost. Fixed cost also include the cost of

operating equipments, cost of infrastructure development (i.e. stabilizing the concrete cemented pond etc).

So far there is no thorough financial analysis of the trout production in Nepal. Based on the data collected from the FRS Trishuli and the small scale private sector's farms, some preliminary calculation can be made. Applying the data from the private farm, total costs including total fixed cost and total variable cost. With a cost of about NRs950 to produce 1 kg of trout, which is sold for NRs 1200 per kg. This analysis assumes that fish seed is purchased by the owner and feed made by owner. So, investment cost for the hatchery are not included. The cost of fish seed is calculated as the price at FRS Trishuli and cost for transportation with loading and unloading, cost for electricity and overtime for manpower. The cost of materials tools and labour is lower than the government farm, because the farmer himself is able to handle the farm very well with his family. The analysis shows a profit of NRs 950 per kg of trout fish which gives a rate of return of 49.33% of total cost. The B/C rate of trout farming in Kakani is 2.62 which shows the fisheries project is profitable one (table6).

Table 4.10: Cost and Benefit associated with the Farm

A. Variable cost

SN	Particulars	Quantity	Unit Price (Rs)	Unit	Total (Rs)
1	Feed for table fish	1500	60	Kg	90000
2	Seed of Trout (Fingerlings/Vuras)	21000	10	Rs.	210000
3	Wages			Rs.	86400
4	Glassware/tools/Chemicals			Rs.	20000
5	Farm Fuel			Rs.	30000
6	Electricity			Rs.	40000
7	Marketing Cost			Rs.	95000
8	Others			Rs.	80000
	Subtotal				651400
B. Fixed or Non-operative Cost					
1	Salary for manpower	365	600	man/ day	219000
2	Raceway construction	1	450000	Rs.	450000
3	Water Supply System/pipes	1	27000	Rs.	27000
4	Stores/workshop	1	150000	Rs.	150000
5	Drag net	3	1500	Rs.	4500
6	Netlons/graders/cages/hapes	24	300	Rs.	7200
7	Maintenance Cost	3	27010	Rs.	81030
8	Telephone/ communication			Rs.	12000
9	Gasoline/Travelling			Rs.	120000
	Subtotal				1070730
C. Total Cost= Variable Cost +Fixed Cost					1722130
D. Revenue Collection					
Total Fish Production(10% Mortality Rate)			3240	1200	kg
E.Net Income			Total Revenue -Total Cost		2165870
B/C Ratio			Total Revenue /Total Cost		2.257669

Source: Field Survey, 2014

CHAPTER FIVE

PROBLEM AND PRESENT STATUS OF RAINBOW TROUT FARMING

5.1 Problems of Rainbow Trout Farming

Rainbow trout farming is new innovation in Nepalese economy which was started from a decade ago by the private sector. It is complex and challenging system of farming where fisheries have vital role to transform traditional agriculture and raise the living standard of the people. Rainbow trout fish farming offer a better alternative and greater contribution particularly to the livelihood of the people living in the mountainous region. Despite the great possibility, farmers face the different types of problems during trout farming. Some them are listed below:

- Lack of insurance of trout fish
- Insufficient capital for investment
- Lack of cold store house and cold water
- Inadequate seed supply and lack of quality feed factory
- Lack of trained human resource in trout extension
- Limited study on demand and supply
- Inadequate marketing channel
- Lack of awareness among local communities

Besides the above mentioned problems there are several problems in cultivation and marketing of Trout Fish. These problems are described below briefly under the following headings.

Flood: The major hindrance in the trout cultivation is flood in rivers and streams during the rainy season. The flood in the rivers and streams cause flow of turbid and impure water in the raceway ponds and consequently this turbid, dirty and impure water negatively affects the health of the fish and sometime even cause death of fish by depletion of dissolved oxygen. Due to turbid water the trout also gets difficult to see the feed properly and grow up very slowly due to less feed intake. Sometime poisonous water flow in the ponds from the streams and this poisonous water kills the fish rapidly. The turbid water also causes the blockage of pipes. During the time of flood, the high current of water also causes the breakage of ponds.

Lack of loan facilities and high interest rate: Trout cultivation requires high initial investment along with high production cost. It is very difficult for the marginal farmers to involve in trout cultivation. The bank doesn't give loan to the farmers who are ready to keep their houses and lands of Trishuli on mortgage.

The bank asks for the land of Kathmandu. Similarly the interest rate is very high that the farmers are getting difficulty in repayment of loan.

Feed: Farmers don't get all the feed ingredients at a place and at the time when required. So, the timely feeding to the trout gets affected. The cost of the feed ingredients and the feed is also getting expensive and the farmers are getting difficulty in the purchase of feed and feed ingredients.

Political instability: During the time of strikes and revolts, the farmers become unable to purchase the required feed and feed ingredients due to which they become unable to feed the trout timely. Similarly, the strikes affect the marketing of trout. They become unable to deliver the trout to those who orders for it. Almost, all the farmers (70%) have their own hotels. They don't get even single customer during the strikes. The shortage of petroleum products also creates problems in the purchase of the materials required for the trout cultivation including timely deliver of the orders.

Disease: The wings and tails of the trout get rotten and the faeces turn yellow. However, these problems are solved by the administration of antibiotics. But sometimes, the medicine given by the government is not effective. It may be due to the inexperienced technicians.

Partiality: Some of the farmers are not getting the subsidy given in the purchase of fingerlings by the government. Similarly, some farmers are also deprived of the economic support provided by the government for the trout breeding.

Lack of cold storage facility: All the produced quantity of the trout gets sold in the market but due to lack of cold storage facility, they cannot harvest the appropriate size of the fish. They have to leave the fish in the pond until gets sold in the market. This leads to the additional feed cost.

The problems encountered by the hotels/ supermarkets/valley cold store are listed below:

- The producers/suppliers are not supplying the trout regularly in the hotels/supermarkets/valley cold store of Kathmandu valley due to which they are unable to serve their customer regularly. The trout is available only in season and the scale of production by the farmers is very low as compared to demand. So, some hotels are in the way to remove the trout dish from the menus.
- The price of the trout is not reasonable and is very high. There is no standard price policy and there is monopoly in fixing the price of the trout. The selling price charged by the big and old farmers is slightly higher than the small and new farmers.
- The producers don't supply the trout of appropriate and uniform size in the hotels. They have to go to the trout farms themselves for getting appropriate size.

5.2 Present Status of Rainbow Trout Farming in Nepal

Rainbow trout culture in Trishuli is being practiced in water coming down from glaciers, where as spring water is used in Godawari station. The area of trout farm at Trishuli is about 2,000 square whereas it is nearly 300 square meter at Godawari. The breeding of rainbow trout was imitated around 1990. The experiment on rainbow trout cultivation started around 1993. At present production technology has been developed and verified in farmers raceways. To date private sector involvement is limited. However, the private farmers are attracted towards trout farming in Nuwakot, Rasuwa, Pokhara and Kavrepalanchowk districts. Number of trout farmers is being increased every year and production is also increasing, which increases employment for the local communities and reduce poverty. Late Mr. Gopal Lama of Kakani VDC-4, Ranipauwa, Nuwakot district is the first private trout culturist in Nepal. He started rainbow trout culture in 1998 on the trial basis. Presently, Mr. PurnaBahadur Lama (son of Mr. Gopal Lama) has been growing 40,000 - 70,000 fingerlings of rainbow trout each year in an area 270 square meter (Field survey, 2014).

Total production of trout in Nepal is estimated about 150 metric ton in the year 2014. Where production from private sector contributes 80 percent (120 metric ton).

Table 5.1: Present Status of Rainbow Trout in Nepal

S.N.	District	Production amount (in metric ton annual)
1	Nuwakot	91
2	Lalitpur (Godawari)	7
3	Rasuwa	20
4	Pokhara	22
5	Kavrepalanchowk	10
	Total	150

Field Survey, 2015

5.3 Management Practice of Trout Farming

Trout culture is intensive type of farming which might confronted with environmental issues unless responsible way of culture technique is practiced. Potential sources in trough production requires better gives hence and significant improvement in genetic quality of brood stock for quality seed production, improved feed technology and feed management, reliable diagnosis and effective disease control programs and maintaining hygiene and sanitation of harvested product have led to increases in production efficiencies. Farmers should encourage adopting code of practice for mitigating negative environmental and social impacts. Conductive policy, strong efforts in human resource development to increase researcher capabilities and education program for technical personnel's' as well as farmers are equally important.

CHAPTER SIX

FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 Major Finding of the study

Trout is a new product in Nepal, and the species is still unknown to most of the Nepalese. Nepal has suitable agro-climatic conditions in hills and mountains to produce trout wherever adequate fresh cold running water is available.

Agricultural development is a gradual process and an equally challenging sector, whereas fisheries have a vital role to transform traditional agriculture and raise the living standard of people. Fisheries are in an infancy condition in Nepal, which contributes least to the Agricultural Gross Domestic Production. Rainbow trout fish farming is a new innovation in the Nepalese economy, which was started a decade ago by the private sector. Despite the greater possibility, the Nepalese government cannot overwhelm all over to the potential areas.

The main objectives of this study were to diagnose the problem and prospects of trout farming in the Trishuli corridor. For the entire report, we can summarize that there is a great business scope for rainbow trout farming in Kakani of Nuwakot district. Rainbow trout farming is economically sound and highly profitable business. The B/C ratio of 2.257 for the integrated trout farms shows that trout business is financially sound and its scope is very high, due to which the number of trout farmers has increased to 25 in 2070 B.S. from only 1 farmer in 2054 B.S. The major findings of the study are presented as follows:

- Among 14 respondents, 60% are literate and only 40% are illiterate. The level of education in farmers is satisfactory because it is around the national average.
- Land holding size of the study area has been 183 Ropani. Among 183 Ropani of land, the maximum land is used for cultivation, which is utilized as growing different crops and vegetables, and the small area of land is used for the plantation, which includes different types of trees, which absorb the rain water and provides a cooler environment to the raceway for the survival of trout fish.
- 75% of the respondents depend on subsidized income other than agriculture, for which the source of income has been service and business, 40% respectively.

- The major inspiring factor of rainbow trout fish farming or high profit and good market availability which comprises more than 80% of the respondents. The 14.2843% of the respondent believe it as new innovation to inspire them.
- Total production of trout in Nepal is estimated about 150 metric ton. in the year 2014. Where production from private sector contributes 80 percent where as 20 percent contributes from government sector.
- The value of NPV, BCR and IRR is 2306036, 2.62 and 49.33 percent respectively.

6.2 Conclusion

From the whole report, we can conclude that rainbow trout production is highly profitable business. Though it is profitable, number of farmers involved in trout farming is very little. In Nepal, trout farming has high potentiality. It could have cultivated in cold and running water. The water temperature should be in average range, other content in water should be reasonable amount and improper condition.

Market place for this is big hotels, restaurant, elite group and negligible numbers of local consumers. Marketing channels is very short, so no agent could cloin for the profit margin. Demand on the particular product could be increased highly if consciousness is increased.

Farmers are fully dependent on Rainbow trout marketing for running their life. But they also involves in vegetable farming and other income generating activities. Both educated and uneducated people generating involve in trout farming.

Some enterprises in private sectors are interested in the business. But they are in dilemma, wheatear to start or not due to lack of technical support. Even the famers are in the same condition. So, it can be further expanded if full support is given in this sector. Some NGOs and INGOs involved in this has helped in the growth of the trout farming.

Technical support and financial support to the farmers may enhance the production level of trout fish as well as the productivity. But service from the ADB is very little to the farmers. Feed rate provide by the NARC to the private farmers is very high. It could be minimized to get higher return. If it is lowered, profit itself will rise.

Trout farming is very risky enterprise and required higher investment. The main risk in the trout business is flood which may cause loss of huge amount of money by the death of thousands of fish. However, it can be prevented by high care and management. The price of the trout is high as compared mostly by the rich people. The price can be lowered if the cost of the feed is lowered and the middle class people will also be attracted in the trout consumption. Decrease in the feed cost will also result in the decrease in the investment. In addition to this, easy loan sanction with low interest rate, technical and financial support to the poor and marginalized farmers will stimulate them to get involved in the trout culture; as

a result the production volume of the trout will be increased which will help to meet the national demand.

The trout farming is really a powerful weapon to uplift the economic condition of the Kakani, VDC and the persons involved. The government and private sectors should take new place in trout cultivation. The government and private sectors should leave no stone unturned to produce the trout in large scale to meet the national demand. It may be achieved by providing technical and financial support to the farmers, exploration of the feasible sites, decrease in the cost of feed, easy loan sanction with low interest rate etc.

6.3 Recommendations

After the analysis of the finding the researcher comes up with the some recommendation which have been listed below.

6.3.1 Recommendations for Government Level

- Government should use mass media for trout marketing and promotion with in the country.
- Government must be established hatchery and breeding programme to the farmers.
- Initial matching fund (at least 50 percent of total construction costs) should be provided by the government as a subsidy otherwise farmers cannot bear the whole costs and will not motivated.
- Literacy rate among the respondents found good but all respondents should be made literate and there is a need to provide literacy programme targeting to the rainbow trout fish farming farmers in the study area.
- Implement the rainbow trout fish farming programs and policies to facilitate the rainbow trout fish farming farmers.
- Provide subsidy on rainbow trout fish farming for Vuras (fingerlings) production, to develop of raceways, and equipments for the farmers to expurgate them to apply these inputs for higher production.
- Open a branch of Agriculture Development Bank and other financial institutions in the study area, which could provide loans to the farmers in a cheap interest rate and in a more efficient way.
- Establish the storage center for rainbow trout fish because farmers are facing the problems of storage.

ANNEX I

HOUSEHOLD SURVEY QUESTIONNAIRE

Date _____

2. GENERAL INFORMATION

Name (HHH) :

Village/Tole:

Sex (M/F) :

Type of House:

Age : No

Education:

Cast/Ethnicity:

Occupation:

Land holding:

Annual Income (Rs):

3. INFORMATION ON Rainbow trout fish farming

f. Do you have Rainbow trout fish farming business

a.a How did you know about this business and when you start

g. Do you registered this business? What is the name of your Rainbow trout fish farming?

h. From where do y ess

i. How much cost did you invest for this business ?

j. Do you think trout farming could be attractive alternative sources of income ?

e.e. How much you earn from one year

f. what kind of problems you face during this business

g. Have you taken lone ?

h. How much time is necessary for this business ?

i . Do you think this busine:

j. Are you satisfied Rainbow trout fish farming business ?

k. What problems are you facing in Rainbow trout fish farming business

9. DO YOU HAVE ANY SUGGESTIONS?

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