Chapter-1

INTRODUCTION

1. Introduction

Pakistan is an agrarian economy. More than 60% of its population live in the rural areas and earn their livelihood from agriculture. Pakistan also depends on agriculture like other developing countries. Generally agriculture sector is categorized in Dairy farming, crop production and fish farming which primarily provide food, in addition it also provides some important resources to industries which are based on agriculture. They are collectively called as the major contributor to the GNP in Pakistan. The main determinants of the fish production are farm area, Number of fries, and capital. Fish density may be an important determinant of growth or survival through competition for prey resources(Brumbaugh2010).Increased fish densities have led to reductions in preferred prey, while total zooplankton populations were unaffected by lower stocking densities, leading to improved larval fish growth (Fox & Flowers 1990; Qin et al. 1994).It was also found that per unit output and net income were inversely proportional to the surface of the pond (Jayaraman1999) .

1.1 Statement of the Problem

Pakistan like other developing countries is facing with lacking protein in the diet of the people. With the increase in Population the problem is becoming more and more severe. Increase in fish production through Aquaculture could be an important source of animal protein (www.google.com).Due to the growing population and increased home construction on agricultural land, I felt the need to give a serious attention to fish farming. The Production and consumption of fish not only meet the needs of food and nourishment, it is also the primary source of income for the people attached with this enterprise, this research thesis will focus on various issues related to fish farming. An attempt will be made to seek answers to the following research questions:

- Is fish farming a profitable business?
- Has it any impact on the living standard of the people living in the sample area?
- Whether fish farming is a viable enterprise?
- What are the problems which create hurdles in the development of the fish farming sector?
- How the development of the fish farming sector can be made possible in the rural areas of KP?
- What suggestions should be recommended for the continuous growth of this sector?

To seek answers to the above research questions a comprehensive research study entitled "Economic Viability of Carp Fish Farming and its Impact on the Living Standard: A Case Study of Selected Districts of KP" was proposed to undertake.

1.2 Research Design

This section explains the overall format of research study includes: main objectives of the study, Development and testing the research hypothesis and scope of the study.

1.2.2 Main Objectives

An attempt was made to achieve the following objectives during the whole process of this research exercise.

- To identify the area, production and consumption of marine and in land fisheries in Pakistan and to ascertain the growth of fisheries;
- To analyze the current situation of various species of fisheries resources in the KP;
- To assess the socio economic profile of CARP fish farmers in the sample area;
- To investigate the total farm area, production, and yield per acre of the sample fish farms;

- To test the viability of the carp fish enterprise by using the NPV, BCR, and IRR criteria;
- To ascertain the variations in output of fish and to determine the marginal physical products of various inputs by estimating a Regression Model;
- To evaluate the future prospects of expansion of fish farming and to determine its economic impact;
- To draw conclusion and propose recommendations on the basis of above objectives;

1.2.3 Hypotheses to be tested

The following research hypotheses were tested during the research process of this dissertation. It is assumed that:

- The overall production of Carp Fish is growing in Pakistan
- An attempt is being made to improve the situation of various species of fisheries resources in KP
- The socio economic profile of Carp fish farmers in the target area is substandard
- Yield per acre of the sample fish farm is low
- Carp fish farm is a viable enterprise
- The marginal physical products of various inputs are high in fish farming
- There is a significant room for the improvement of economic profit or net returns of carp fish

1.2.4 Scope of the Study

The geographical area of Khyber Pakhtunkhwa province of Pakistan is covered by this dissertation. So in terms of the scale of study, various issues attached to the production of carp fish in the province is also discussed in this research.

1.2.5 Organization of the study

The study has been divided into nine chapters. Chapter 1 included introduction and background of the study. The literature review related to the cold, semi cold and warm water fish was reproduce in Chapter 2; Chapter 3 contained the Research Methodology showing the universe of the study, sample size of the study, sample area and data collection techniques. Chapter 4 had the information related to Marine Fishery production, Consumption and exports at Macro level followed by Chapter 5 which included the information related to fish farming at messo level i.e. Fisheries in the province. Chapter 6 Analyzed Socio Economic Profile of the Carp Fish Farmers. Chapter 7 focused on the economic analysis of the fish farms followed by empirical analysis of models for output and viability of Carp Fish farming in chapter 8. The Main findings, Conclusions and Recommendations were summarized in chapter 9. The report was followed by bibliography, appendix and questionnaire.

1.2.6 Limitation of the study.

The wonderful growth of fish farming highlighted various issues related to fish farming, including fish diseases and their control. Fish disease is because of the stocking density;inputs used in pond and required temperature of water. In fish farms, fish fries are released more than the required number of fries and thus give rise to various diseases. Uncontrolled and improper hunting of fish and poor farm supervision is also considered as a source of a variety ofinfections/ viruses which caused deaths, low progress, give rise to infertility and shrink productivity.

The fish are affected by viral, bacterial, fungal/ / pest infections and disease. In addition, the poor quality of water in fish ponds also put the fish under pressure that can lead to fish mortality. As each specie has different diseases and different measures are required to overcome& control these diseases. To minimize maximum losses requires another type of research which is not possible at this stage.Due to time constraint and lack of financial resources I left this portion of fish farming for future studies.

Chapter-2

REVIEW OF LITERATURE

After Brief introduction in the previous chapter, an extensive review of literature related to fish activities, like production, cost, benefits and consumption etc. has been reproduced in this chapter.

Panayotou (1982) provided a systematic structure for the supervision and expansion of coastal small scale fisheries in developing countries. The basic management concepts are briefly reviewed: biological and economic aspects, followed by social considerations. They are examined for their appropriateness to single species and multi-species fisheries. These concepts need refinement both for biological and socioeconomic reasons. The article describes the barriers under which several small scale fish farm operate. These may for the time being call for top levels of fishing efforts than acceptable from a pure economic effectiveness point of view. Any long term progress in the livelihood of small scale fishermen will call for some forms of human interference which will distribute the resource between various sectors of the fishing business and in broad sense limit the growth of fishing to prevent wastage of capital(physical capital, Financial capital, and human capital). The paper discusses various measures to adjust fishing effort in small scale fisheries; the preference among these managing alternatives should be based on a set of proper economic and social criterion. Due to the geographically isolated nature of artisanal fisher folk settlements, the restoration and upgrading of conventional protective society rights over coastal resources suggest perhaps the finest feasible supervision choice for small scale fisheries. Instead of controlling the fishing directly, such privileges mean to develop a conducive atmosphere of self-control by the fishermen themselves. The paper concludes with a demonstration of some examples of conventional protective fishing rights in Brazil, Japan, Sri Lanka and Ivory Coast.

Kurien and Willmann (1982) conducted a study in 1980-81, which described the background of Kerala fishing and its characteristics, the methodology of the study, fishing activity during the study period, and provides details of

productivity, costs, earnings and profitability of various craft-gear combinations. According to the study. Two peaks and troughs exist in landings throughout the year but the respective downward and upward fluctuations in prices do not compensate, leading to seasonal variations in earnings. Such variations differ according to other fishing combinations and the species composition of the catch. Intensive asset use can produce high levels of labour productivity even with simple technology. In general, artisanal units made better use of invested capital than mechanized units. Most artisans depended on the internal credit market to satisfy their capital needs; the high interest rates deter over-capitalization and thus stabilize net returns of the fisheries at a high level. Despite the heaviest losses, mechanized vessels produced the highest individual earnings for the fishermen. Net profits being very low on mechanized vessels, maintenance was postponed until the season of high earnings.

Torres and Ventura (1983) conducted a study of economic and social impact analysis of the Aquaculture Production Project, the study assesses its developmental impact. Limited to investigating the effects of milkfish aquaculture on selected areas of social and economic concerns, this focus on bingos culture is justified by two considerations: milkfish is the prime aquaculture species in the country; and the milkfish technology available at the initial phase of the Aquaculture Production Project was already sufficient to predict potential increases in bingos production at lowered costs. Initial investigations were concentrated on the region in which milkfish monoculture was most prolific, though secondary data were collected elsewhere. Improved aquaculture methods evolved at demonstration farms in the areas of fertilization, feeding, survival and stock manipulation, while outreach workers were recruited and trained, and a systematic program for extension was developed for wider dissemination of technologies to farm producers.

Glube (1983) stated that the US market for sea foods generally is large and expanding. In addition, the Prices for sea foods are increasing more rapidly than for meat and poultry**.** The markets for clams, scallops and mussels are expanding rapidly but the US consumes over 50% of the world's oysters but consumption is not increasing. For expanding the market for oysters the recommended actions

include standardization of the products, organization, advertising, diversification of product form and reducing the cost of production, processing and marketing.

Shang and Costa-Pierce (1983) studied the profit of integrated Fish farming and Crop farming systems from an economic point of view, particularly with respect to decline in cost of product, enhancement in effectiveness of resource employment and increase in profit of business. Bio-economic factors disturbing the profitability of integrated farming are discussed. This paper suggests the growth of a system which can join together all of the significant essentials and helps the producer in identifying the best possible line of action.

Innocenti (1984) used the accounts of an existing large unit in Italy in drawing up an investment and profit balance for aquaculture. First, some technical details for three farmed species (including eels) are presented, indicating market prices obtainable, conversion rates in feeding and length of production cycle. Then the costs of establishment of a large production unit are set out. The financial results of the first three years' operation are analyzed, with details of gross saleable product, management costs, inputs required, and indemnification of fixed capital, labour costs and taxes. An annual profit of 15% is achieved in the case study. The possibilities of aquaculture on a smaller scale are also considered briefly; the relevant legislation is listed. Extremely high standards of business management and stockman ship are required, but the sector can produce good returns on investment.

Cunningham et al. (1985) described in the book that how economics can be applied to the investigation of the problems of commercial fishing and to the formulation of policies to deal with them, and how appropriate management policies at the national and international level can bring about optimal use of a valuable natural resource. Recreational fishing (of increasing economic importance in developed countries) and aquaculture are also covered in some detail. The book is intended for fisheries administrators and government planners, managers of commercial fishing companies and fish farms, lecturers and students in all courses relating to resource management, including economics, agricultural economics, geography, fisheries studies, marine biology, environmental studies, aquaculture and oceanography. Main sections cover: Fish and fishing: some

fundamentals; A bio economic model of the fishery; Technical progress: a positive application of the model; Fisheries management: a normative application of the model; Response by firms to the problems of fishing; The regulation of commercial fisheries; Fisheries policy at the international level; Fishing as recreation; Economic aspects of aquaculture.

Klemetson and Rogers (1985) collected and evaluated as part of a study for the Southern Colorado Economic Development District, prospective sites on the bases of site, climatic, engineering and economic considerations**.** Existing resources, fishpond necessities, constructions cost, operation costs and design requirements were incorporated for the assessment of the most viable arrangement for the area.Cost-effective summaries were set outlining total estimated costs and rates of return on production of Macro brachium rosenbergii prawns.

Panayotou (1985) described that because of the new ocean regime of extended fisheries jurisdiction governments of developing countries in Asia, and elsewhere, face a unique opportunity for upgrading their depressed coastal fisheries to take advantage of their enlarges resource base. This volume is a partial response to the resulting need for a better understanding of the constraints and opportunities facing small scale fisheries. It includes 23 research articles on small scale capture and culture fisheries from Bangladesh, Malaysia, Philippines, Sri Lanka, and Thailand, based on field survey coordinated by the international development research center. The main objective was socioeconomic environment, productivity an economic efficiency, cost structure and profitability, marketing, communal and institutional restrictions, and government programs. The studies concluded that the scale for further fisheries development is severely limited by the size of the resource. The achievement of any management scheme taken parallel with development of controls on entry into the fishery, development in resource efficiency and in living standards could development on a broader resource base.

.Churchill (1987) has talked about providing essential legal and factual background material, being concerned with the general international law of fisheries and the fishing industries of EC Member States. Chapter 3 of his work looks at the legal basis of the Common Fisheries Policy and the legislative process by which that Policy is adopted and put into effect; it then goes on to give

a brief historical overview of the origins and evolution of the Policy. Chapter 4 establishes the scope of the Common Fisheries Policy as to subject matter, place, persons and time. Chapters 5-9 analyze the Policy in relation to the five main matters with which it is concerned: the management of resources, relations with third states, structural measures, marketing and trade. In each case the aim is to establish the way in which competence is divided between the Community and Member States, to give an analytical account of the rules which the Community had adopted, and to consider the effectiveness of these rules in the light of their stated or presumed objectives. The broad conclusion reached is that competence to regulate fisheries matters lies primarily with the Community (the residual competence of Member States varying somewhat from area to area); but that in exercising that competence the Community is still some way from achieving what are or should be the objectives of a Common Fisheries Policy. The final Chapter looks at the likely impact on the Common Fisheries Policy of the entry of Portugal and Spain into the EC.

Farrington (1987) identified the types of approximate values of official Sri Lankan Government support received by marine fishermen, measures the cost of this support against the incremental value of catch attributable to a motorization program for traditional craft and the introduction of new craft supported by the Ministry of Fisheries, and suggests cost-effective methods of expending the marine catch in the future. It first examines nominal subsidies to fishermen since 1958, and the effective rates of subsidy which are seen to exceed nominal levels by the extent of default on losses and by the erosion of debts by inflation resulting from delayed payments. It goes on to look at important substitution effects, and the rationale behind subsidies in relation to three types of vessel used by Sri Lankan fishermen. Subsidies has been fairly indiscriminate, and a more specific targeting of subsidies towards development more consistent with a national fisheries strategy, such as the use of smaller engines, and the exploitation of natural anchorages and beaches, would generate substantial savings for the state in the costs of subsidies, fuel and infrastructure, with little risk that production levels would be affected.

Garcia-Bartolome (1987) aquaculture has been newly to Andalusia; this paper sets out to assess its current importance and its potential. Andalusia is well favored with climate and inland or protected waters to develop the industry. The industrial structure being promoted is that of cooperatives, and a series of social, economic and biological difficulties are hindering developments at present. The evolution and current situation of Andalusia aquaculture is described (private companies currently occupy far greater areas than cooperatives). The output of firms, cooperatives and other groups is detailed by species cultivated; whereas cooperatives usually invest in mollusk production requiring simple technology and low investment, private companies have concentrated on fish and shellfish. Social aspects of aquaculture are described: employment rates, age and background of cooperative members. A set of recommendations is made for each of three problem areas: technical, social and financial, in order to improve prospects for development.

Reynolds and Grevoral (1988) the fisheries of Lake Victoria, East Africa, have undergone significant changes in recent years due, in particular, to the fast propagation of the introduced Nile perch (Latesniloticus).Severe debate has been done over the impact of the said introduced predator species on the fisheries of Lake Victoria, particularly with respect to the environmental disorder of common species and its probably unfavorable socioeconomic cost. The current analysis of the socioeconomic aspects of the growth of the Nile perch fishery shows the impact of Nile perch to have been both vague and profound. Internationally, the Nile perch fishery has been so far an extremely optimistic growth from an economic gain and food resource perspective. In contrast, some severe issues demand vigilant concern and further analysis. These issues are related to the distribution of gains with respect to the elementary issue of sustainability and to the comparative function of artisanal and major fishery operations**.** The fisheries of Lake Victoria, and the Nile perch fishery in particular, could persist to provide high yields and significant benefits for the riparian communities concerned in Kenya, Tanzania andUganda under proper management.

Ridler and Kabir (1988) farming of Atlantic salmon has expanded rapidly in Europe, and, despite an initial lag, also in Atlantic Canada, particularly New Brunswick. Salmon farming can be profitable. It is a growth industry in the southwest of New Brunswick, a region which presently has the highest unemployment rate in the province. The industry has already generated approximately 300 person years of work and further job creation will occur as the industry expands. The report examines these socioeconomic aspects of salmon farming. Salmon culture is regarded as complementary to, rather than competitive with, the commercial fishing of Atlantic salmon; the report analyses the impact of aquaculture on the commercial fisheries. Profitability is demonstrated using Norwegian data and hypothetical data for Canada. Concern over imminent market saturation is examined by estimating price and income elasticities of demand. The results indicate a strong domestic market with some potential for exports. Overall, the prospects for expansion appear promising, with expected socioeconomic benefits for the Atlantic economy.

Hepher, 1989). The biological value of protein in food is naturally also those high amino acid profiles are very similar to the requirements of the species consumed (De Silva et al. , 2006). Weekly gain is inversely proportional to the stocking , as already noted by Lanarietal., (1989). He further investigated that in spite of manure andsupplemental feeding, stocking density of grass carp is indirectly related to body weight, length and depth of the pond**.** These results might guide us to suggest that lowering stocking density of grass carp with tilapia up to a profitable size is appropriate of the short nurture period with using supplementary feed. Higher stocking densities should require longer time as well during the culture season of fish. Abdel-Wares (1993) argued with rising stocking density the weight of Nile tilapia decreased but the total yield increased. Kestmont **(**1995) concluded that expansion and output of each type of carp may be high in polyculture than in monoculture because of direct relationship among species. De Silva (2006) concluded that, Nile tilapia grow happily in polyculture system with no common carp, most likely because these type of specie fight for non-natural feed. This could explain the superiority of grass carp yield which achieved rabbit dung as natural manure.

Kaufmann (1991) the document contains two research articles concerning rural development issues in Nigeria. The first contribution by W.O. Olatubi, pp.1-53, examines the economics of aquaculture in Nigeria, focusing on homestead fish production in concrete ponds in Lagos State. The second contribution by C.U. Nwajiuba and G.A. Anyanwu, pp.55-75, quantifies rural female labour inputs to agriculture in Imo State.

Olatubi (1991**)** investigated the profitability of homestead aquaculture in Nigeria, focusing on whether this system is suitable for adoption by households, particularly in rural areas. It examines: the average cost of establishing and operating a homestead fish pond unit; the average revenue generated by such an operation; the profitability or otherwise of the concrete pond system; the input-output relationships of the system. It concentrates on Lagos State, which being the capital state has a small rural population of some 60,000 farm families. There are about 150 fishing communities along the coastline and the lagoon shores of the state, providing work for an estimated 25,000 fishermen. Aquaculture is not well-developed in the state, since natural resources are readily available, and its potential is not fully recognized. A decisive political commitment is needed to push ahead with viable aquaculture projects, accompanied by detailed development plans for different ecological regions of the country. Recommendations are made to enhance the concrete homestead fish pond programme.

Folke (1992) argued that economic development depends on and may be limited by ecosystem life support. The quantitative estimates reveal that Baltic fisheries and Norwegian fish farming are dependent on large ecosystem support areas, and that coastal seas put constraints on the possibilities to physically expand fisheries and aquaculture**.** It is suggested that fisheries and aquaculture management would benefit from combining experiences gained in local level community- based resource management with principles of ecological engineering.

Kula (1992) looked at the economics of fisheries, beginning with a discussion of the property rights and common access which are to a large extent peculiar to the sector. A comparative static economic theory of the fishery is presented, and this is followed by presentation of a dynamic economic theory of the fishery. The current situation in world fisheries is discussed, and the role of the UN Law of the Sea conferences in terms of exploring commercial and legal matters regarding the use of seas is covered. Fishing in EC waters and some aspects of fishing in US waters are discussed. Use and usefulness of rightsbased fishery management is explored.

Steiner (1992) the method of producing fish fry in illuminated underwater cages on the basis of natural plankton is a highly innovative development of the Waggle and Ensiles methods. Results of experiments with freshwater fish in various Austrian lakes show survival rates of 70%-80% at all economically specified stocking densities. Costing shows that both production and investment costs are lower than those for other methods. Preliminary experiments with tropical sea bass suggest the method could also be profitably applied to marine fish and even in implementing sea ranching projects. The technical and economic characteristics of a well tested design for a modular system, suitable for operation in fresh or sea water is described in the paper.

Zweig (1992) verified mathematical computer models that simulate aquatic ecosystem dynamics can benefit agricultural planners and farmers who consider pond fish culture as a component of integrated farming schemes. Models of this kind can be structured to determine management and support requirements as well as the resultant impact of the added component on the farm budget and overall economic performance. An example, EcoLogic 2.1 (C): A Computer Simulation Model of a Carp Poly culture Pond, is reviewed and applied in the determination of the optimal area ratio of nursery and production ponds within an integrated fish farm design in a type commonly found throughout China. The results from model simulations of fish production under differing climatic regimes are also reviewed. The simulation models provide the capacity to evaluate the impact of various design and management options. Supported by ancillary calculations, the model can further correlate the pond dike area required for forage production as fish feed

and the number of livestock for organic fertilizer needs. The implications for financial decision making and for other applications are discussed briefly.

Hatch and Kinnucan (1993) conducted research on the economics of producing and selling aqua cultural food, this amount addresses important issues about profitability, market acceptance, and economic modeling of various aqua cultural products. Research approaches range from firm level bio economic modeling to market level econometric modeling of industry growth and product substitution. The studies underline the institutional structures and public policy issues that will form expansion and growth of aquaculture into the twenty first century, together with trade policies, food security, and ecological quality. The book is divided into four parts: farm-level optimization models; farm management applications; econometric industry models; and marketing applications.

Hopkins and Manci (1993) according to USDA estimates, an additional 1000 million pounds of fish will be eaten in the USA in the year 2000 compared to 1992. A seven-fold increase in world supply shortfall for aquaculture products by the year 2025 is predicted. The predicted world demand is not likely to be met by increased ocean harvest. If the equivalent of the US demand is met by domestic aquaculture products, the industry would more than double its present production level. The market for aquaculture products thus offers enormous economic opportunity for US producers. These papers examine this situation, offering a hypothetical expansion scenario, and focusing on factors relevant to the success of the industry, including product identity, improved value, sustainability and education.

Gwiazda (1993) investigated that the extremely useless Common Fisheries Policy (CFP) extended fisheries crisis in EC member countries has been caused**,**by completion of which is the basis of numerous controversies among the member countries**.** This paper analysis the economic aspect of this policy and current efforts aimed at the alteration of the CFP and enhancement of the effectiveness of the fishery sector**.** In the view of the author, the EC Fisheries directorate has not yet taken on board the major findings of the fisheries economists that the only way to avoid surplus ability appearing or re-appearing after a capacity cut is to charge for the right to fish. All earlier attempts with the help of CFP schemes to

decrease fishing effort have been half measures**.** From the economist's point of view, there is little to choose between quotas, tie-ups or larger net sizes, since all the policies are sub most advantageous**.** They are introducing economic inefficiency to reduce efforts which restricts all vessels and raises over all costs**.** It was analyzed in this paper that some resources must be initiated for extracting from the industrythatincome which would tentatively be due to the owner of the fishing position, in order to avoid too various resources entering the industry**.** Such resources could contain payments for fishing licenses, a tax on landings or a tax on fishing effort**.** It will be unfeasible to permit fishing effort and capability proficiently if such a rectification to CFP policy is not introduced**.**

Kinnucan and Hatch (1993) aquaculture in the USA has proven economic potential, yet many challenges remain. Competition from imports and capture fisheries, externalities associated with pond effluent, groundwater depletion, and governmental trade policies and regulation are becoming increasingly important as aquaculture becomes integrated into the US economy. This paper discusses factors affecting future growth potential and emerging research issues. The most successful commercial ventures in the USA have occurred where ready markets existed for farmed fish and production costs could be reduced sufficiently to make the product competitive. Building on these principles, the basic theme of the paper is that economic research should focus on ways to reduce costs while at the same time increasing the value of aqua cultural products traded in domestic and international markets.

Bhatta and Giriappa (1994) stated in his paper that the food production has kept pace with population growth in India, it has placed under strain the agricultural production, processing and distribution systems. As a result, concerted efforts to develop the country's fisheries began and mechanization of all stages occurred. The trend in marine fish production has shown a fourfold increase during the last four decades. The increase or decrease in the annual marine fish production of the country depends on the success or failure of sardines, mackerel and shrimp fisheries. Fish is used mainly for human consumption and patterns of utilization of marine fish varies from state to state and depends on catch composition. There

is inadequate understanding of the relationship between development programs and the diversity of fishing communities. The government has initiated efforts to promote changes through technological innovations and the development of markets both of which have had a profound impact upon the fishing communities. Within the fisheries sector, competition between mechanized and non-mechanized fishermen has led to considerable differences in incomes in favors of mechanized fishing households. Marine fishing is one of the main industries in Karnataka state. The growing inequality of income based on infrastructure development and technology has led to a sharply divided fishing community in Karnataka.

Born. (1994) revealed the macroeconomic determinants and its impact on total output during this study**.** He analyzed the improvement of output of the world aquaculture in terms of commodities, species, countries and regions**.** The impact of the results of policy and planning for the future development of aquaculture was particularly analyzed**.** With the increase in income food consumption in both aquatic and meat has considerably increased.With the increase in per capita income the proportion of the meat food aqua decreased and showed the relative importance of aquatic food in low-income countries**.** A relationship betweenthe consumption of food and aqua aquaculture production was considerably observed in Asia, Europe and worldwide, therefore, it is argued that fishing smooth the way for the development of aquaculture. The growth of finfish tends to connect with agricultural growth. In Africa and Latin America aquaculture production is low as compare to the consumption of aqua food. In the near future there is a highest probability of rapid growth in aquaculture production in these regions.

Jayaraman (1999) analyzed in a survey consist upon a sample of Forty fish were randomly selected having fish ponds with a total area of 26.59 ha in the Thanjavur district, Tamil Nadu State. (India).On the basis of pattern of input used and production ,the farms were distributed into five categories**.** It revealed that changes in output were mainly because of the levels of input used. The farms having the output in the range of 2,000 and 4,000 kg/ha/year about 63% of the total. The use of labour did not significantly affect the level of output. Average yield and net income showed to be directly proportionate to the levels of input

used. Respondents indicated that carp farming was profitable. The average total cost was Rs.77, 950/ha which includes Rs 52,223/- and Rs 25,727/- variable cost and total fixed cost respectively while total income was Rs 1,45,824 and Rs 67,874/- was the net profit. It was also found that per unit output and net income were inversely proportional to the surface of the pond. The average yield ranged from 2364 kg / ha / crop in the pond category from 0.81 to 1.20 ha to 3111 kg / ha /culture in the case of basins least 0.40 ha, each. A parallel tendency was also observed in the net income.

Elhendy & Alzoom(2001) conducted research about thecosts of tilapia farming in the Central Region of Saudi Arabia. The selection of 23 respondents was made by cross sectional data having concentrated fish farms. It revealed that the importance of varied cost items such as variable costs and feed costs in total costs. The Ordinary least square and a cubic cost function was used for the estimation of cost functions and found the bestfit to the existing data. It was found that the profit maximizing level of output was 300 tons per year per farm and cost minimizing level of output occurs for 201 tones of tilapia per year per farm. All farms were operating at less than profit-maximizing level and majority were operating at less than minimum efficient scale. It may be due to poor quality fry, inadequate level of managerial skills in culturing tilapia and the secondary nature of tilapia farming. The future growth of Tilapia farming was expected to boundbecause of the shortage of water resources in Saudi Arabia.

Olagunju, Adesiyan and Ezekiel(2007)argued in their research that fish has high natural value in terms of high protein preservation in the body allows for protein nutritional diet (AnthonioAkinwumi, 1991), as compare to other animal protein sources. It has a higher protein as replication low cholesterol content. It is one of the safest sources of animal protein (Slang, 1973). Farming sector generates employment to the people directly and indirectly associated in the fishing output and other related business. It is a source of income for all categories of people concerned with fish farming and thus contributes to the national income. On other side livestock needs money, space, time and has a higher rate of feed conserving

Lochmann (2007). Increased fish densities have led to reductions in preferred prey, while total zooplankton populations were unaffected by lower stocking densities, leading to improved larval fish growth (Fox and Flowers 1990; Qin et al. 1994).

Hassan Salehi (2007) conducted a study the result obtained from the three main provinces quite clearly demonstrate that carp farming is a profitable activity with an average of 12% rate of farm income in 2001. The economic viability of carp culture has been noted by Pillay (1990) and Salehi (1999 and 2004) in areas where there is a market for carp and appropriate technologies are used too. The results of the survey showed that the various producer provinces have different cost structures, depending on accessibility and quality of inputs, farm management, environment, area of farms and other factors. In 2001, feed and fertilizer, seed and labor and salaryare the major input costs in Iran, however Rusydi and Lampe (1990) and Salehi (1999 and 2004) indicated that the basic inputs of feed and seed constitute the principal cost of operating a carp farm. In Guilan, where carp culture is older and farmers have smaller farms and may manage ponds on an ad hoc basis, they usually use agricultural wastes as feed and fertilizer, but in Mazandaran the price of feed and fertilizer was higher than elsewhere, consequence 50% production more than the average.

Hassan,Sayed And Ibrahim(2008) conducted a research and conclude that most favorable fertilization is a management practice to enhance biological productivity using organic fertilizer. In addition, the fertilization rate is the amount of organic matter that can be gainful and are used in the pond ecosystem without having any adverse effect on water quality and growth of fish (Bhakta et al. , 2004). Therefore, the Natural Nutritional role of productivity is clearly important to maximize nutritional intake in order to reduce feed costs (Collins , 1999). The aim of this study is to evaluate - the effects of plant density, organic fertilizer and supplementary diet on the growth performance of the blue tilapia and grass carp reared in earthen ponds .Natural forage organisms usually contain a high proportion of protein, with an average of more than 50-60 % protein on a dry matter basis.

Kudi, Bako and Atala (2008) in their research considered capital as durable and nondurable capital items used in fish production**.** The capital used for the construction of pond and area specified for the pond were named as durable capital items, while the capital used for the purchase of feed, fingerlings were named as the non durable capital items that farmers purchase from the market. The study exposed that, two types of feed available to farmers; local feeds made by local feed mills and foreign or imported feeds. The study reveals that (86%) of the fish farmers used feeds imported from abroad, whereas 14% used local feeds made by the local feed mills. The study further revealed that (43.2%) of the farmers like to culture Juveniles, and 18.2% chose to culture fingerlings and 38.6% used both. Capital is also required in the form of money for funding all production activities. The result showed that majority of the fish farmers rely on personal saving for meeting their production activities, whereas on 4.5 % of the farmers used group funds and 2.3% used additional sources to meet the finance for the fish production

Brumbaugh (2010) observed that Fish density may be an important determinant of growth or survival through competition for prey resources. Fox and Flowers (1990), Qin et al. (1994), and Huang and Chiu (1997) studied larvae of different species, but all showed that with increasing density of larvae, individual growth decreases; however, these findings have been variable relative to the effects of larval fish density on percent survival and fish yield. Rees and Cook (1983) found that Georgia ponds stocked with original cross hybrid striped bass larvae at $38 \cdot m^{-3}$ had the highest rate of survival (35.9% ± 6.4), while ponds stocked at 144 $larvae \cdot m^{-3}$ produced the largest number of fingerlings at harvest ($41 \cdot m^{-3}$) but at a lower survival rate (28.4% ± 4.6) . Tank experiments with reciprocal hybrid striped bass revealed that individual TL and weight decreased with increased larval densities and that total yield increased with stocking density; however, the densities tested in these experiments were extremely high, ranging from 20,000 to 120,000 $larvae \cdot m^{-3}$ (Ludwig and

Benjamin (2012) discussed about the technology of composite fish culture', in his paper which was developed for the cultivation of fish in India, is the most sophisticated and accepted in the country. This technology allows farmers to

maximize fish production from pond or reservoir by using objects, food available at all natural outlets, fish food supplemented by non-natural feeding , fish farming in short term which depends on compatibility and type of fish use, Rohu and Mrigal. Apart from silver carp, carp, common carp and other fish species in India as well as exotic varieties have been identified and recommended for culture the technology of combined fish culture.

Theoretical frame work

Extensive literature summarizes that there are three important factors which can influence the productivity of Carp fish i.e. Pond area, number of fries and capital.

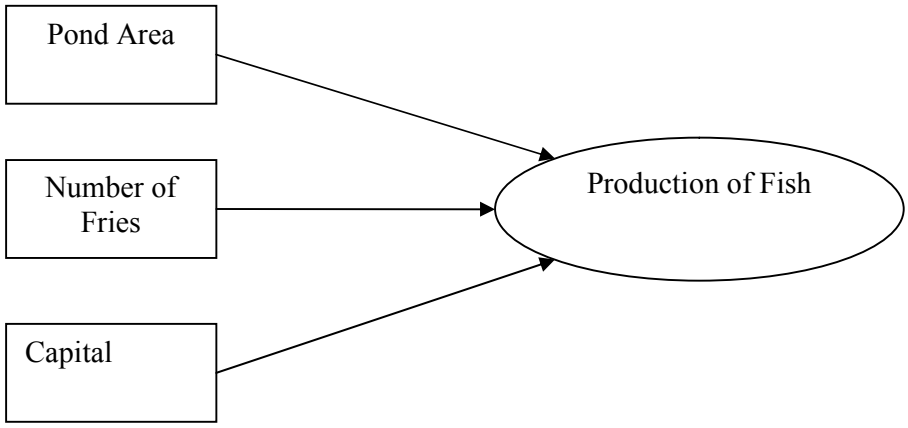
i) Pond area has direct relationship with production, greater is the pond area, greater will be the space available for the fries to move, sufficient amount of food they will have and by this way greater will be the size of the product, greater will be the quality and quantity of fish.

ii) On other hand production has negatively related to the density. Greater is the number of fries, the available fixed space will insufficient for the increased number of fries. There is over utilization of the resources which will negatively affect the size of the product and growth of fish farming will decline.

iii) While capital plays a very important role in the enhancement of any enterprise therefore there is positive impact of capital on the production of fish and for the growth of fish farming sector. Capital in the form of money is needed to purchase the necessary inputs for the production purposes.

Conceptual Frame work

Following is the conceptual framework of this study namely, PNC Model



Conclusion from Review

In this chapter the available relevant literature was given. It was found that sufficient literature is available on the subject concern and almost all the aspects from production to marketing, consumption of carp fish and other fish had been taken into account. But literature lacks answers to some of the questions raised in the statement of problem. Besides the present study was approaching to the solution of the problem by adopting the three stages study procedure i.e. .Macro, Messo and Micro. All this will enable us to pragmatic approach to the problem and its solution.

This study has been conducted at narrow as well as at broader sense, the narrow level study was undertaken to the fisheries situation, economic and socio Economic conditions of the fishermen at Province level. The broader sense of study was addressed to related questions in the context of Pakistan as a whole. In this context the true prices(Shadow prices) were taken into consideration rather than the market prices.

In macro level of this study economic analysis were taken into consideration instead of the financial analysis. In this study not only the role of fish farming in the income generation of the fishermen was taken into account but its impact on

employment generation, living standard of the people living in study areas was also taken into account. The contribution of this sector in poverty alleviation and in decreasing the income gap has also been highlighted.

Chapter-3

RESEARCH METHODOLOGY

The chapter highlights the methodology used for the achievement of the above mentioned objectives and verification of the hypotheses with special focus on methods of data collection, sampling design and analysis techniques.

3.1 Sources of Data

As is obvious from the nature of the study both the

i) Primary and
ii) Secondary data were used.

In the former case an interview schedule address to the fish farmers was used. All the relevant information was secured from farmers directly during the face to face contact(See the subsequent section). While in the later case data related to the province wise - area, production, consumption and export etc. at the national level as well as the provincial level was obtained from the files/records of the Fishery department and other published sources.

It is worth mentioning all the three types of data Viz.

i) Time series data
ii) Cross sectional data and
iii) Panel Data

were used for the analysis of data . While using the primary source of data collection the cross sectional data was obtained from sample fish farmers. But in case of secondary source Panel Data (A combination of Time series and cross sectional data) was used.

3.2 Research Instrument

A comprehensive interview schedule pertaining to the information related to the fish farmers and farms was scheduled. The interview schedule was pre-tested in the field. It was ensured that information related to all relevant variables which fulfill the requirements of objectives was obtained. After incorporating all the omissions and commissions, the interview schedule was finalized.

3.2.1 Validity and Reliability of Questionnaire.

The questionnaire used in this study was developed in the light of literature review. It is carefully designed covering all the objectives of the study. The questionnaire assessed in this study proved to be a valid and reliable tool to measure the information about CARP Fish farming. It can be used in determining specifically the Economic and Socio Economic status of the Fish farmers and for agriculture sector in General more readily and consistently. It is not only providing the current economic status of the fish farmers but it is also identifying the area where the farmers are the most deficient.

3.3.1 Sampling Design

This section of dissertation focuses on the definition of sampling unit, sampling Frame/ Universe, sampling size and its distribution.

3.3.2 Sampling Unit

Each carp fish farmer in the selected sample area was known as the sampling unit for the purpose of this study.

3.3.3 Universe/ Sampling Frame

A list of all sampling units (Carp Fish Farmers) in the selected districts of KP constituted the universe or sampling frame of the study.

3.3.4 Sampling Size

The basic characteristics of Carp Fish Farms and farmers in each stratum were assumed to be homogeneous; hence a very small proportion of the universe would fairly represent the whole.It was proposed that double of the small sample at margin that is 60 fish farmers was the sample size for this dissertation.

3.4 Distribution of Sample Size/ Selection of Respondents

For the selection and distribution of sample, a combination of simple random sampling and stratified Random Sampling techniques were used. As a first stage the whole province was divided into three zones from the location point of view of the Hatcheries.

For the purpose of this study, these zones may Zone–I, i.e. "Peshawar Valley", including Mardan, Sawabi, Charsadda and Nowshera districts, Zone-II, i.e. all districts to North of Peshawar valley including Chitral, Dir, Malakand, Swat, Bunir, Mansehra and Harripur districts. Zone-III comprised of districts on the south of Peshawar Valley, that is Kohat, Bannu, LakkyMarwat, D.I. Khan and FATA. Fish from type of water point of view was divided in to two groups Viz. Hot water fish or cold water fish. The focus of this study was on the analysis of carp fish (Which is a hot water fish). it was therefore proposed that Zone 1 and Zone 3 were included in the study area, because generally fish in zone II is assumed to be cold "water fish". These zones will be considered two different strata of the target area. And two districts from each stratum were selected in these districts purposively on the basis of maximum number of the CARP fish farms. A list of all Hatcheries in the selected districts was prepared with the help of Fishery Department. This list is served as the sampling frame. The proposed sample size was 60 fish farms which were distributed among various sub strata (Selected Districts) proportionately, using the following Formula:

$$ni = \frac{Nin}{N}$$

Where

ni =Sample size of i^{th} substratum

Ni = Total Number of Fish Farms in the i^{th} sub Stratum

n= Sample Size (60)

N =Total Number of Fish Farms in the sample area (Selected Districts)

The break up of the sample size was as follow:

Table 3.1

Zone No/ Districts	Total Number of Fish Farms (Ni)	Sample (ni)
ZONE I		
i) Mardan	133	23
ii) Sawbi	66	12
Sub Total	**199**	**35**
ZONE III		
i) D.I. Khan	104	18
ii). Kohat	41	7
Sub Total	**145**	**25**
Grand Total	**344**	**60**

For the selection of respondents, (Fish farm operators), simple random sampling technique (Using the lottery method) was used. All the carp fish farm operators were visited personally and relevant data was collected through interview method, using the interview schedule.

3.5 Analytical Techniques:

i) The collected data was tabulated and classified in appropriate tabular form**.** The averages and percentages were calculated and their significance was tested, using the following "t" statistics.

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$$

ii) The viability of the fish farming was examined by the following appraisal criteria:

$$NPV = \sum_{t=0}^{n} \frac{Bt - Ct}{(1+r)^t}$$

$$BCR = \sum \frac{Bt}{(1+r)^t} \Big/ \sum \frac{Ct}{(1+r)^t}$$

$$IRR = (lower\ \ Discount\ \ rate) + (Difference\ between\ the\ t$$

Where

C_t = Discounted cost

B_t = Discounted benefit

r = Social discounted rate

t = Time period (t = 0, 1,2,3,4…….)

iii) **Econometric Models**:

Models for output of carp fish for small and large fish farms were developed. It is assumed that all other factors remaining unchanged, the main determinants of Carp fish production "Q_F" were the farm area(in acres) "F_A", number of fries "N_F" and total consumable inputs and capital assets "KCA". To determine the degree of influence of each determinant on the production of Carp Fish, the following linear production function was estimated, for the estimation of the parameters the ordinary least square method of estimation was used.

$$Qf = \beta_0 + \beta_1 FA + \beta_2 NF + \beta_3 KCA + Ui \text{ ----------} 3.1$$

The above model shows that Qf =F(F_A , N_F, K_{CA}) . They were first studied thoroughly by a 19th-Century scientist, **Sir Francis Galton.** Galton was a self-taught naturalist, anthropologist, astronomer, and statistician**.** Galton was a pioneer in the application of statistical methods to measurements in many branches of science, and in studying data on relative sizes of parents and their offspring in various species of plants and animals (Wikipedia 2015). The relationship of the dependent variable with the Farm area is expected to be positive. So the production of Fish is assumed to increase with the increase in the area of the pond. The output of fish is expected to be positive as well with the number of fries and the investment.In addition to this Linear Regression Model, for the estimation of output elasticities of two major inputs land "P" and Capital "K". The Cobb- Douglas Production function of the type

$$QF = AP^{\alpha} K^{\beta} e^{ui} \text{ ---------- 3.2}$$

was used. Where "QF" was the output of Carp fish, "P" the pond area, "K" is the capital . The parameters "A" showed the impact of annuation. The greater the value of "A" the more advance is the technology. The Parameters "α" and "β" are the output elasticities of inputs "P" and "K" respectively. The sum of these output elasticities helped in the identification of stage of return to scale.

iv) The Marginal Physical Products (MPPs) of these major inputs will be calculated by differentiating the estimated Cobb-Douglas Production function as follows:

$$MPPP = \frac{\partial}{\partial P}\left(AP^{\alpha} K^{\beta}\right)$$

And

$$MPPK = \frac{\partial}{\partial K}\left(AP^{\alpha} K^{\beta}\right)$$

For the exact numerical values of MPP's the average values of Pond area "P" and Capital"K" were substituted in the differentiated function.

In order to test the technological difference between small and large fish farms and the significance of the equality of parameter estimates of the estimated production function for different farm sizes, the following CHOW F Ratio was used.

$$F^* = \frac{\sum e^2p - (\sum e^2_1 + \sum e^2_2)/K}{\sum e^2_1 + \sum e^2_2 / n_1 + n_2 - 2k} \quad \text{----------3.3}$$

Where

$\sum e^2p$ = Sum of Square of pooled residuals
$\sum e^2_1$ = Sum of squares of large farm residuals
$\sum e^2_2$ = Sum of Square of small farm residuals
n_1 = sample size of large farms
n_2 = Sample Size of small farms
K = Number of parameters

The Chow test was invented by economist **Gregory Chow** in 1960 during his study of the title "Tests of Equality between sets of Coefficients in Two Linear Regressions". The Chow test is mostly used to observe the presence of a structural break in time series analysis. The Chow test is often used to determine whether the independent variables have unlike effects on different subgroups of the population (Wikipedia, 2015)

3.6 Estimation Technique:

The values of the parameters plays very important role in all type of research. These parameters represent the marginal values i.e. MPC, MPS, MPP of the factors of production etc. which plays very important role in economics and in policy making. For obtaining the numerical values of these parameters, Ordinary least square method will be used. In case of Nonlinear form of the model log linear models will be used for estimation purposes.

Chapter-4

FISHERIES IN PAKISTAN

4.1 Marine Fisheries Production

Pakistan has been bestowed upon by nature with a lot of natural resources. The cold and warm water bodies flowing from the north to south are the source of not only water to be used for irrigation and electricity power generation but these are also a source of availing quality sea food, & is a source of earning for poor family, besides its potential to earn foreign exchange when exported. Since independence, Government and responsible agencies are involved in exploiting the fishery potentials of the country. While the situation is not much encouraging as desired after 60 years of efforts, a lot has been achieved.

The average marine fish production since 1999 has been 435,563 metric tons per year. The increase over the last 4 years has been about 20,000 tons annually, or 29% per year. The marine fisheries production of the last three years was as shown in the table 4.1.

Table 4.1

Marine catch of fin fish and shell fish

Area	Zones	2006-07	2007-2008	2008-09	%age
Pakistan		589,731	596,980	654,530	
Marine		422,201	433,446	474,665	72.5%of total (2008)
Fin Fish	Sindh	252,739	257,973	292,421	61.6% of Marine
	Balochistan	129,025	129,456	121,829	25.6%
	Eez	5,883	6,825	18,329	3.9%
	Total	387,647	394,255	432,579	
Shell Fish	Sindh	33,028	37,675	40,626	8.6% of Marine
	Baluchistan	1,381	1,334	1,224	0.3%,
	Eez	145	182	216	0.4%,
	Total	34,554	39,191	42,086	

Source: Marine Fishery Department(2010-11)

4.2 Inland Fisheries

4.2.1 Province wise area covered

Pakistan has vast inland water resources of rivers, canals, dams, lakes, ponds and water logged areas which are very conducive for fishery development. The province wise water areas are as shown in the following table 4.2

Table 4.2

Province wise area covered

	Sindh	Baluchistan	Punjab	KP
Rivers/Streams	160,000 Ha	Not Known	2,940,000	6102 K.ms
Canals and Drains	321,00	Not Known	23,700	1763 Kms
Abandoned Canals	—	-	—	91.1
Lakes	110,000	4,047	6,700	6,362
Ponds/Reservoirs	97,000	6,070	65,800	28,798
Water Logged Areas	6,000,000	—	30,000	—
Small Dams	-	Not Known	3,000	—
Total Area	6,399,100	10,117	3,069,200	7865Kms+ 35,251.1 Ha

Source: Provincial Fisheries Department(2010-11)

Sindh has the maximum water area with 6,399,100Hectares, Punjab is next with 3,069,200 Hectares followed by KP and Baluchistan.

4.2.2 PER ACRE PRODUCTION

Table 4.3

Province Wise per acre production of fish in K.gs

Province	PER ACRE FISH
Sindh	300-500
Punjab	1500
Baluchistan	N/K
KP	500

Source: Fishery Department(2010-11)

Mortality rate in all provinces is 15-20% Majority of fish farms are distributed as shown.

Table 4.4

Total number of fish farms and the area occupied by the farm by the year 2008. (Values in parenthesis is area in Hectares')

Area	2006-07	2007-08	2008-09
Sindh	2,021	1,881	1,996 (65,000)
Baluchistan	65 (170)	71 (195)	75 (200)
Punjab	3,354 (12,727)	4,704 (15,052)	4,940 (17,062)
KP	422 (1,257)	501 (1,271)	516 (1,358.3)

Source: KP Fisheries Department (2010-11)

The Actual number of fish farms is probably more than indicated, as weak extension services inhibit the provinces from collecting accurate data. It may be mentioned here that between Punjab and Sindh, we are producing about 113 million Carp fingerlings annually (Theila, Mori, Rahu) KP has commenced a system of community fish farming, which is showing very good response from the local community. Punjab has the maximum farms numbering 4940, covering an areas of 17,062 acres, Sindh has 1996 over an area of 65,000 acres, KP is next with 516 farms over an area of 1358.3 acres and Baluchistan has 75 farms over an area of 200 acres. The province wise per acre yield is as shown in the table 4.4.

Table 4.4
Province wise distribution of fish farms

Sindh	Baluchistan	Punjab	KP
Hyderabad	Urrak (hatchery)	Sheikhupura	Chitral
Thatta	Sibbi	GujranWala	Swat
Badin	Nasir Abad	Attock	Dir
Dadu		Lahore	Malakand
Sukkar			D.I.Khan
Jacobabad			Kohat
Larkana			Abbottabad

Source: Fishery Department KP(2010-11)

4.2.3 Inland Fish Production

The average inland fish production since 1993 has been 152,785 metric tons per year. The increase over the last 4 years had been about 4,943 tons annually, or 12.35% per year. The figures of inland fish production of the last three years are as shown in table 4.5

Table 4.5
Inland Fish production
(Figures are in metric tons)

Fresh Water Fish	1999-2000	2000-01	2001-02***	% of 2002
Sindh	102,508	106,611	113,082	63
Baluchistan	-	-	-	
Punjab	61,098	59,924	61,530	34
KP	743	840	1,000	0.6
Northern Areas	110	83	85	0.01
Dams	3,71	2,066	4,168	2.4
Total	167,530	163,524	179,865	

Source: KP Fisheries Department (2010-11)

*****: Non availability of the latest data**

Comparing the figures of inland Fish Production (i.e. inland Fish harvested), with the number of fingerlings produced only between Punjab and Sindh, we are not harvesting approximately 18.4 million fish (allowing also for the mortality rate). This fish is valued at Rs. 2.944 Billion. The main reason is the inadequate resources available for harvesting from the Dams, reservoirs, Lakes, etc., as 100% of his harvested from the fish farms.

4.2.4 Total Fish Production of Pakistan

The Average total fish production since 1993 has been 579.5 metric tons per years. The table shows a decrease in total fish production since 1999-2000. The total fish production of Pakistan is as shown in table 4.6

Table 4.6
Total fish production
(Figures are in Metric Tons)

Area ⇨ / Years ⇩	Marin	Inland	Total
1998-1999	438.4	176.4	614.8
1999-2000	451	178.6	629.6
2000-2001	480	175	655.0
2001-2002	400.9	161.1	562.0
2002-2003	400.5	165.7	566.2
2003-2004	386.6	186.2	572.8
2004-2005	349.4	225.0	574.4
2005-2006	342.6	230.0	572.5
2006-2007	344.7	235.5	579.7
2007-2008	338.7	238.5	571.2
2008-2009	339.9	239.8	578.3
2009-2010	339.4	240.1	579.5

Source: Pakistan statistical Year book (2010-11)

4.2.5 Consumption of Fish production

Fish produced in Pakistan is consumed as given in the table 4.7

Table 4.7
Figures are percentage of production

	2006-07	2007-08	2008-09
Total Catch	100 %	100%	100%
Human Consumption	67.96	68.15	70.18
Marketed Fish	4.4	4.8	4.6
Freezing	10.0	8.96	8.82
Canning	0.02	0.00	0.00
Curing	7.90	7.71	7.37
Subsistence	6.18	6.46	5.53
For other purposes	3.6	3.9	3.3
Reduced to Fish Meal	32.07	31.85	29.62

Source: KP Fishery Department (2010-11)

Human consumption figures also include amount exported. The alarming point to note is that 29.82% of our production is wasted and is not fit for human consumption.

4.2.6 Export of the Sea Food

Pakistan is exporting Sea Food to 61 countries of the world, with 54 % of European Countries and 46% to Canada, Japan, USA, China, Saudi Arabia, UAE, Malaysia, Sri Lanka, and Singapore. The value of export to foreign countries is as given in table. There is a need to diversify our world markets.

Table 4.8
Export of Fish and Fish Product to Different Countries. Values US$ (000)

Country	2007-08	2008-09	2009-10
Total	233,692	226,936	296,182
All others	16,198	15,087	15,762
Sri Lanka	5,556	2,983	3,695
Kuwait	5,923	8,718	8,360
Indonesia	4,551	2,842	10,501
Hong Kong	5,209	6,723	12,757
Malaysia	16,585	9,636	12,783
Korea	15,042	17,108	16,931
Saudi Arabia	15,452	20,193	20,102
Egypt	10,538	14,424	18,148
Thailand	53,969	21,872	33,507
Vietnam	8,104	17,316	36,140
U.A.E	34,078	34,039	40,838
China	42,487	55,995	66,658

Source: Trade development Authority of Pakistan 2010-11

Pakistan is exporting less than 10% of our total fish production. The distribution is as shown in the table below:

Table 4.9
Specie wise Fish export from the country
(Figures in metric tons)

	1999-2000	2000-01	2001-02***	%age of exports
Total Production	589,731	596,980	654,530	
EXPORTS **Frozen Fish**	27,968	24,225	34,380	60.13 %
Frozen Molasses	17,717	15,900	13,111	22.93 %
Lobsters	7,999	5,674	9,411	16.46%
Crabs	129	79	116	0.2
Others	91	138	151	0.32
TotalExports (Tons)	53,904	45,975	57,203	100
Exports as % age of total production	9.14%	7.71%	8.73%	

Sources: Marine Fisheries Department (2010-11)

***** latest data not available**

The share of Pakistan's Sea Food exports in the world market as per 1997 figures of the international trade commission is as under

Table 4.10
Pakistan Total Share of Fish Exports in the World Market

Category	Total World import Qty 000tons	Total world import value $Millions	%age of seafood import value	Pakistan Export to World			
				Qty (00)Tons	Values $millions	%age world market by value	%of world market by quantity
Fresh Fish	1500	6110	14	3	5	0.08	0.20
Frozen Fish	4100	7500	18	26	31	0.43	0.63
Frozen Molasses	2100	6500	15				
Fish filters	180	1100	3	21	13.5	1.23	11.67
Fish dried salted	-	9000	21				
Fish smoked	50	378	0.8				
Fish liver	30	310	0.8				
Fish meal	4	9	0				
Shell fish	1300	1000	2.3	21	109	0.99	1.62
Invertebrates	1100	4000	9.4	8	8	0.25	0.73
Ready to eat	1600	6700	16	0.229	0.229	0.07	0.01
Total	11964	42607	100	79.229	173.2		

Source: International Trade commission (2008)

***** Non availability of the latest data**

Analysis of the last two columns highlight that the value of our export is not commensurate with the volume exported i.e., there is virtually no value addition in our exports.

Table 4.11
Share of Fisheries in Pakistan Economy
(Values in Percent)

Year	Fisheries Share in Total Export Economy	Fisheries Share in Agriculture Sector	Fisheries Share in GDP
2008-09	1.23	4.24	0.80
2007-08	1.48	3.64	0.90
2006-07	1.59	3.27	0.81
2005-06	1.86	1.28	0.50
1995-96	2.69	3.18	0.78
1985-86	1.91	2.12	0.62
1975-76	3.37	1.54	0.50

Source: Government of Pakistan (1978, 1982-83, 1991-92, 2000-01, 2002-03,2008-09),*Economic Survey,* Economic Advisor's Wing, Ministry of Finance, Islamabad

The role of fisheries in Pakistan Economy is increasing since 1975-76. Its share in Gross Domestic Product (GDP) and in agriculture sector is contentiously increasing but a decline in its share to total export is noticed. This may be due to over fishing, post harvest losses and insufficient storage facilities.(Dr. Noor Ahmad Memon 2011)

4.2.7 Projected Export Earning in Next three Years

From Immediate Projects (mentioned earlier)	$260 M
From Present System	$213M
(15% annual increase) No other improvement)	
If Sindh trawlers are permitted to fish in Baluchistan	$76M
	Total = $549M

Fish consumption of Pakistan is increasing,It is the food of the poor but looking to its nutritional status one can find easily that its consumption is increasing day by day in Pakistan. In 1975-76 per capita consumption was 1.28, which increased with an average per capita consumption to 1.77 in the year 2002-03. The province wise per capita consumption is shown in the table 4.12.

Table 4.12
Consumption of Fish in Various Provinces of Pakistan
(Kgs per capita per annum)

Year	Punjab	Sindh	KP	Balochistan	Pakistan
2002-03	1.00	2.98	0.71	5.28	1.77
2000-01	1.00	2.90	0.65	5.15	1.76
1995-96	0.98	2.58	0.41	4.61	1.81
1990-91	0.74	3.71	0.74	4.62	1.70
1985-86	0.57	4.10	0.04	7.60	1.80
1980-81	0.36	4.30	0.17	15.0	1.99
1975-76	0.12	4.25	0.04	6.80	1.28

Source: Government of Pakistan (1980, 1991-92, 2002-03), *Agricultural Statistics of Pakistan.* Ministry of Food, Agriculture and Livestock, Islamabad

Table 4.13
Total number of Fishermen in Pakistan

Province/ area		2002-03	2003-04	2004-05
Pakistan		416,405	378,878	336,180
Marine		118,094	119,199	121,520
	Sindh Coast	84,190	84,772	85,104
	Baluchistan	33,904	24,427	36,416
Inland		298,311	259,679	214,660
	Sindh	115,270	118,436	74,286
	Punjab	167,422	127,959	130,271
	KP	9,000	9,000	5,708
	Mangla Dam	415	157	600
	Tarbela Dam	74	69	-
	Chashma Barrage	3,300	1,700	1,700
	Hub Dam	225	117	88
	Khan pure	36	12	19
	Northern Areas	2569	2,229	1,988

Source: Marine Fisheries Department(2010-11)

A vast majority of the people are living beside the bank of the rivers in various areas of Pakistan having an occupation of fish catching; besides there are many who have constructed their own ponds and are involved in Fish business in Pakistan. A total 4,16,405 Fishermen are involved in fish catching profession in

2002-03 this number falls to 3,78,878 in the year 2003-04 and the numbers further decreased to 3,36,180 during the year 2004-05. Province wise total number of Fishermen in this profession is given in the above table.

Comparison of Pakistan Aqua culture development with other Asian Countries.

The fisheries sector plays a vital role in the provision of food and reduction of poverty in various parts of the world. In many countries foreign exchange generated by the fishery sector is more than the revenues earned from any other food commodity i.e. rice, cocoa, coffee or tea (FAO 2004). According to the Economic Survey of Pakistan 2006-2007 (ESP 2006-2007). For many rural population living along the coast-line of Sindh and Baluchistanfisheries are the main source of survival , and inland along the major rivers, and in the premises of lakes and dams. The total fish production was 637.8 metric tons in the year 2006. It is estimated that the fisheries sector provide direct employment to about 3.79 million fishermen and 0.4 million people in subsidiary industries (State Bank of Pakistan).

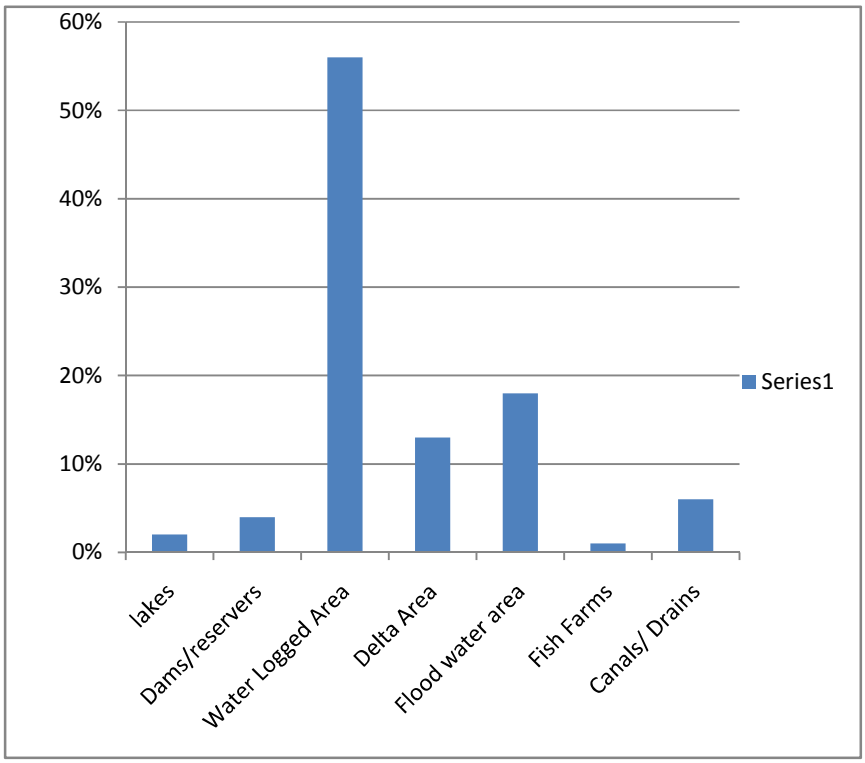
Per head fish consumption is 1.8 kg which is one of the lowest in the world. But still it is also a main source of diet for many people, mostly for those living in rural areas.It contain high level of vitamin 'A'with15-20% protein, phosphorous and other useful nutritional supplements. It contains very low contents of cholesterol (Mazid 2002).

Table4.15 shows that during 2009-10 the fisheries sector showed an Increase of 30% in export, though the fisheries sector contributes a very small share to Pakistan's total GDP. This sector contributes to the national income significantly through export. Fish meat and fish provisions are among the top 17 export items and second among primary commodity category exports after rice (Figures from the Trade Development Authority of Pakistan (TDAP 2009-10) .The total of US$ 296.182 million of foreign exchange were earned during the 2009-10 from the export of fish and fishery products. The leading countries to which fish were exported are China, U.A.E, Thailand, Belgium, Malaysia, Korea,China, U.A.E.

Hong Kong, Thailand, Saudi Arabia, Belgium, Japan, Malaysia and Sri Lanka (TDAP 2007)

Figure 1

Water Resources of Pakistan



TDAP 2009-10).

The above graph shows that very little percentage of the water resources are used for the enhancement of production while maximum area of water resources is wasted due to water logging & salinity.

Table 4.14

Export of major commodities from Pakistan

Values in US$ (000)

	Major Items	2010-11	2009-10	% change
	Agro & Food	4,280,143	3,107,744	37.73
1	Rice	2,160,265	2,183,865	1.08
	(I) Rice Basmati	962,703	855,832	12.49
	(Ii) Rice other varieties	1,197,562	1,328,033	9.82
2	Fish and Fish preparations	296,182	226,936	30.51
3	Molasses	10,419	49,913	79.13
4	Fruits & Vegetables incl. juices	593,093	379,040	56.47
	(I) Fruits	292,422	239,387	22.15
	(Ii) Vegetables	268,203	120,643	122.31
	(Iii) Fruit & Vegetable juices	32,468	19,010	70.79
5	Spices(incl. Chillies)	50,384	40,945	23.05
6	Feeding stuff for animals	46,276	39,166	18.15
7	Oil seeds, nuts and kernals	19,430	19,169	1.36
8	Crude animal material	42,232	28,291	49.28
9	Crude fertilizer	64	162	60.49
10	Guar and Guar products	46,731	26,524	76.18
11	Tobacco	27,333	14,791	84.79
	(I) Un-manufactured	24,338	13,706	77.57
	(Ii) Manufactured excl.cigarette	2,529	600	321.50
12	Wheat	586,603	735	79,709.93
13	Wheat flour	267,039	1,271	20,910.15
14	Leguminous vegetable	1,754	33	5,215.15
15	Sugar refined	-	50	100.00
16	Mutton	61,390	42,324	45.05
17	Beef	71,414	55,014	29.81

Source: Trade and Development Authority of Pakistan(2010-11)

Pakistan has a substantial level of resources i.e. 290270(km^2) of marine (National Institute of Oceanography, 2007) with 1120 km long seaboard and approximately 8563820 ha of inland waters as shown in table below:

Table 4.15
Pakistan Water resources

Resources	Area
Marine(km^2)	50,270
Continental shelf	24,000
Zone Total Marine	290,270(km^2)
FRESH WATER	
Rivers/ Streams	3102408(hectare)
Canals/dams	346803
Lakes	127109
Waterlogged area	3031600
Deltaic Area	700000
Flood water area	1000000
Fish farms area	60230
Total fresh water	8563820

Source: DOF Sindh (2010-11)

In Pakistan, Fish culture has been growing at an excellent rate. A carefully analysis clearly indicates that it utilize only about 1% of the available water resources while others such as waterlogged areas (56%) and flood water areas (18%) return a disorganized fisheries production (Table 4.15).Sensibly no attempt has been made to properly utilize water resources for fish culture. Due to substantial irrigation systems millions of hectares of waterlogged areas created, (FAO 2003). There is a need of effective planning for making the proper use of this waste area for effective fish farming.

As far as the Sindh province is concerned thecondition is further annoyed by the fact that the mean expansion of pond area and output is contradictory to each other.

Another hurdle in the way of development of this sector is its data insufficiency. Either the data is unavailable or its reliability is questionable. This can be observed from the reality that the data related to fish farms and fish production show on weaker side because there may be numerous of fish ponds which are not reported or could not be surveyed by the fisheries departments due to their inadequate staff, be short of monetary resources, transportation and other hurdlesi.e. the law and order situation, political instability etc. up to 40% of the fish farms are missing from the record. To find out the reliable information a complete survey is required to be carried out in the country, mostly in far-flung areas**.**The similar position is right for the facts about the fish production in the country particularly of the inland areas because the fish catches that close at small inland marketsand fish catches for the living also need to be observed and recorded for thewholedemonstration of fish production in the country.

Pakistan's marine fish fauna are commercially important which comprise of demersal fish, Small pelagic, medium size pelagic and large pelagic fish.It consistsupon some 250 demersal fish, 50 small pelagic, 15 medium-sized pelagic and 20 large pelagic fish.In addition, there are 15 commercial species of shrimp, 12 of squid/cuttlefish/octopus, and five of lobster. There are fresh water species consists upon more than 200 fish species and 35 of shellfish together with prawns and crabs. Around 20 fish species are commercially important (as shown in table 4.17)

Table: 4.16
Fishery Resources Potential(000 tones)

	Makran Coast	**Sindh Coast**	**Total(000 tones)**
Small pelagic	140-240	320-520	450-750
Demersel	120-200	170-290	300-500
Total	260-440	490-810	750-1250

Source: Surveys of Pakistan Fishery Resources, 2010-11

According to FAO statistics, the involvement of aquaculture to world supplies of fish, crustaceans, mollusks and other marine animals mounting from 3.9 percent to 27.1 percent of total production in 1970 and 2000 and 32.4 percent in 2004. Fish output is rising more quickly than other animal food-producing sectors. This sector has developed at an average rate of 8.8 percent per year since 1970, where 1.2 percent for capture fisheries and 2.8 percent from the culture fisheries. Production from aquaculture is more than population growth. Per head supply from aquaculture increasing from 0.7 kg in 1970 to 7.1 kg in 2004, showing an average world growth rate of 7.1 annually . In 2004, countries in Asia and Pacific contributes for 91.5 percent of the production quantity and 80.5 percent of the value in the world aquaculture production, with China, India, Viet Nam, Thailand, Indonesia and Bangladesh among the top 10 producers in aquaculture production. (FAO 2007).

Table 4.17
Fisheries and aquaculture production of selected Asian countries

Country	Freshwater Area (Hactare)	Aqua culture production	Aqua culture growth rate	Per capita fish consumption (Kg)	Total production (capture+culture) (tones)	Exports value (000$US)
India	5700000	45734658	6.3	5.0	6318887	1591851
Bangladesh	4560900	882091	7.8	15.0	2215957	359472
Sri Lanka	N.A	1724	N.A	25.0	163684	3137
Indonesia	1165000	1197109	6.9	23.6	5578369	1872961
Malaysia	NA	175834	7.8	60.0	1390017	634370
Philippine	NA	557251	-0.4	N.A	2803603	347830
Viet naam	1700000	1437300	30.6	30.0	3367200	2741127
Myan mar	NA	474510	45.1	N.A	2217466	460057
Nepal	NA	22480	N.A	1.6	42463	15
Iran	NA	117354	16.5	6.1	527912	34107
Thailand	8563820	1144011	10.8	32.0	3743398	4465767
Pakistan	NA	80622	4.2	2.2	515095	194

Source: (FAO 2007)

Fisheries FAO United Nations

Pakistani water resources having the capacity to provide fish output up to 1.0 million tons per annum from Marin fishery resources alone according to different surveys conducted in the continental shelf area as shown in table 4.16. This output can be increased by preservation and sea ranching as declaring marine protected areas to sustain production as declaring marine protected areas and alternate fishing zones**.** Whereas the Extensive Riverine Irrigation System Provide an advance network of ponds, lakes canals, marshes, waterlog areas, dames, natural depressions etc. which is one of the world's largest contiguous irrigation systems, spread upon around 63,000+km (FAO 2003); covering more than 8 million hectares; and has an enormous potential to produce high stocks of fish.

For the Growth of fish production using the available resources there is a need of taking crucialsteps , and to find out new dimensions to get further production through aquaculture. Pakistan has better growth in fisheries sector. An over view to compare Pakistan with some other Asian countries is given in (table 4.18) (data correspond to the year 2005 except where indicated).

The foreign exchange of Thailand and Vietnam from the export of aquaculture is highest in the region (FAO 2007). Whereas Bangladesh has half the inland fishery resources of Pakistan but has 7-8 times more production, only from inland sector, 53 % of which comes from aqua-culture (Mazid 2002). Bangladesh were producing 914,752 tones aquaculture production and at number three in inland capture fisheries with a catch of 732,000 tones (FAO 2006-07). This surprising performance is due to high level of investments made by the government and the donner agencies. In Bangladesh, 54% of all the investments in the fisheries sector have been spent on aquaculture development(Mazid 2002). A comparison of Pakistanand Bangladesh has been given in table 4.19 to readily assess the above situation**.**

Table:4.18
Comparison of Water resources and production of Fish of Pakistan and Bangladesh

	Area		Production(000 tones)		
	Marine(km^2)	Fresh water (Hactare)	Marine	Fresh water	Total
Pakistan (2006-07)	290,270	8563820	339.4	240.1	579.5
Bangladesh (2006-07)	207163	4560900	455.207	2065.723	253.296

Source: MINFAL Pakistan(2006-07) ***** non availability of the latest data**

Fishery statistical year book of Bangladesh 2006-07

This sector demands necessary measures for planning active hard work to encourage yield from Marin, brackish and freshwater, which have a remarkable potential for fish and selfish production during aquaculture development. At the time of planning, it is necessary to observe the global trend which apparently shows demonstrate28.9 million tons which is more than $3/5^{th}$ of fish production comes from inland.

The inland areas presents prosperous prospects for the growth of inland production of fish due to its wide irrigation system and a broad network of the water resources and area is wasted due to water logging which can be economically utilized with a little modification whereas the coastal areas need comparatively a huge amount of investment most possibly by shared culture. The inland aquaculture sector requires to be addressed on priority basis.

It is essential to focus the production of those species which have greater demand in international market and the culture of those species should be made which are suitable for export. This will not only act as a source of food to the people living in the rural areas but also it will stronger the rural economy and will reduce poverty among the farmers living in the rural areas. The fish sector has the capability to catch 1 billion dollars annually from the international market. This is only possible if the fish farming resources are diverted towards export oriented. The development of this sector will not only strengthen our economy but our export will also increase (EC Prep report June 2005).

Chapter-5

FISHERIES IN KHYBER PAKHTUNKHWA

The Khyber Pakhtunkhwa(KP) is richly endowed with water resources for aquaculture development. Its vast cold, semi-cold, and warm water zones produce large variety of fish among which Trout in cold water zone, Mahaseer and Swati fish in semi-cold water zone, and Rahu, Mori, Thaila, and Chinese carps in the warm water zone are the well-known ones.

Fishing has since long been a source of income and employment to thousands of persons living on the river belts of the province. This is particularly true of Dera Ismail Khan division, where commercial scale fishing has been going on since long and has made considerable progress in recent years. The other important districts in this respect are Swabi, Haripur, Mardan, Mansehra, Swat, Charsadda, and Peshawar.

Although richly endowed with aquaculture development potential, to develop this sector not much was done in this province inmost other parts of the country until the early seventies. That was the period when agriculture crop was the main focus of agricultural development planning of the country. The fisheries sector, however, came into sharper focus in the seventies when the search for economic diversification began and awareness developed of the vast development potential of this sector.

5.1 Fisheries in KP

It is the responsibility of fishery department to promote and develop aqua- culture in KP.

Objectives of the fisheries Department KP:

The mandate of the Fisheries department KP is to make fish protein available to the masses on sustainable basis. To achieve this goal, the Department has the following objectives:

1. To Develop Fish Farms in public and private sector.
2. To Protect Fisheries resources of the province.

Measures adopted to develop fish farming:

For the sustainable development of fish farming in the province, the department has focused on the following activities**:**

- Expansion and sponsorship of farm fisheries in private sector.
- Introduction of exotic varieties of quickrising fishes.
- Extension services to the private fish farmers.
- Training facilities to the private fish farmers and staff of the department.
- Investigation ofdifferent aspects of fisheries.
- Support tourism duringimprovement of leisure farms.

5.2 Measures adopted to conserve fisheries resources

Fisheries department KP has adopted following measures to conserve the depleting fish stock in natural waters.

- Frequentlyreserve fish seeds in the natural/artificial waters to refill the fish fauna.
- Applyblocked seasons during propagation of a variety of fish species i.e.1st October to 9th March for cold water fish and 1st June to 31st August for warm water fishes.

Implement fisheries Ordinance, 1961 and Fisheries Rules, 1976, that aims to;

- Judicially administer fisheries resources by issuing licenses.
- Checkunlawful fishing.
- Control meshes size of nets.
- Establish fish protection committees to curb illegal fishing.
- Promote awareness among masses, through “Hujra Talks” at village level.

5.3 Fisheries resources of the Province

KP has considerable aquatic resources of Warm water, Semi cold water and Cold water.

5.4 Warm water fisheries

To cope with the demand of fish seed by the private sector and to replenish the existing fish stock in natural waters, the department is operating and maintaining the following carp hatcheries;

Table 5.1
List of carp hatcheries in government sector

S. No.	Name of Hatchery	District	Production Capacity
1	Ichrian	Mansehra	100,000 fries
2	Charbanda	Mardan	600,000
3	Tanda	Kohat	350,00
4	RattaKulachi	D.I.Khan	600,00
5	Sher Abad	Peshawar	9,000,000
6	SaroBadakhel	Bannu	6000,000
7	Kalaya, Parachinar	Orakzai agency (FATA)	
Total			10,250,000

Source: Fisheries Department KP(2010-11)

The following species are artificially propagated in these hatcheries.

5.5 Endemic Species

Rahu. *Labeorohita*

Mori. *Cirrhinamirigala.*

5.6 Exotic species

Silver Carp. *Hypotialamicthyes molitrix.*

Grass Carp. *Ctenopharyngodonidella.*

Common Carp. *Cyprinuscarpio.*

5.7 Semi Cold-water fisheries

Semi cold water resources in KP are dominated by, Mahaseer (*Tar putitora)* Swati *(Sehizothoroxspp)* China *(Racomalabiata).*Kalaha/ Asala (*Schizopygeesocinus).*Because of its food and game value, Mahasher population in natural waters is declining rapidly. The Department has started a rehabilitation programme for Mahasher in order to maintain its population in natural waters, for this purpose the Department has established a hatchery at Chakdara (Malakand agency) to produce fish seed for replenishment of natural waters.

Name of Hatchery	**Agency**	**Production capacity (Fries)**
Mahasher fish hatchery	Malakand	100,000

For the Development of Trout Fisheries in the province the department is operating seven hatcheries for stocking in public waters and supply to private fish farmers.

Table 5.2
List of Trout Hatcheries in Government Sector

S. No.	Name of Hatchery	Districts	Production
1	Shinu	Mansehra	150, 000 Fries
2	Madyan	Swat	200,000
3	Alpuri	Swat	50, 000
4	Dubair	Kohistan	100, 000
5	Kalkot	Dir	100, 000
6	Jaghoor	Chitral	120,000
7	Dombret	Batagram	130,000
8	Alai	Kurrm agency (FATA	100,000
9	Malana		-----
Total			950,000 “

Source: Fishery Department KP(2010-11)

The following exotic fish species are propagated at these hatcheries,

LOCAL NAME	SCIENTIFIC NAME
Brown Trout	Salmotrutta/ fario
Rainbow Trout	Salmogairdneri
Kamloop Trout	Salmogairdneri

Source: Fishery Department KP(2010-11)

5.8 Profile of Private fish farmers in KP

Major potential for increasing fish production lies in fish farming on commercial scale particularly in private sector. Efforts were always made to promote and develop fish farming in private sector. As a result of such efforts 816 number private fish farms having an area of 1590.0 Acres have been established in the province(DOF 2010). Beside these fish farms 22 private fish hatcheries have been established in private sector. Whereas great number of fish farmers are on their way to establish fish farms on commercial scale in near future.

Table 5.3
An overview of fish farming in private sector is given as under

Year	No. of Fish Farms.	Area (Acres)
1991-92	150	201
1992-93	152	512
1993-94	192	578
1994-95	221	604
1995-96	378	1190
1996-97	422	1257
1997-98	501	1271
1998-99	516	1358
1999-00	550	1385
2000-01	550	1385
2001-02	565	1399
2002-03	567	1405
2003-04	567	1405
2004-05	580	1450
2005-06	620	1460
2006-07	700	1498
2007-08	816	1590

Source: KP, Fisheries Department (2010-11)

Table 5.4
District wise Private Carp farms hatcheries

S. No.	District	No. of Farms	No. of Hatcheries	Area (Acres)
1	Mansehra (Rest)	30	---	7.706
2	Battagram	5	---	0.124
3	Haripur	6	---	2
4	Swat	7	---	3.24
5	Buner	10	---	3.88
6	Dir	10	---	6.50
7	Malakand	1	---	1.00
8	Chitral	9	---	3.172
9	Mardan	133	---	139.38
10	Swabi	66	---	40.09
11	Peshawar	20	---	17.10
12	Nowshera	25	1	15
13	Charsadda	25	---	24
14	Kohat	41	---	74
15	Bannu	20	---	3.938
16	Lakki	30	---	36.75
17	D.I.Khan	132	5	990.1
18	FATA	10	---	3.00
	Sub Total (i)	580	6	1370.975

Source: Fisheries Department KP (2010-11)

Table 5.5
Private trout farms/hatcheries

S. No.	District	No. of farms	No. of Hatcheries	Area (acres)
1	**Chitral**	9	2	4.919
2	**Kaghan**	22	---	3.00
3	**Kohistan**	15	---	0563
4	**Swat**	28	10	5.719
	Sub Total (ii)	550	16	140.201
	Grand Total (ii)	550	16	1385.176

Source: Fisheries Department KP (2010-11)

5.9 Achievements of the Department

The Department has successfully transferred farming technology to private sector due to which six carp hatcheries and eight trout hatcheries have been established. A new hybrid has successfully been produced by cross breeding of female "Bighead Carp" with the male "Grass Carp" by stripping method. The department has launched a scheme for the artificial propagation of Mahasher seed, for supply to private sector and for replenishment of natural waters.

The department has supplied fish seed to the neighboring country, Afghanistan. The department has imparted trout culture training to the fisheries personnel from Baluchistan, Azad Kashmir, Northern areas and Afghanistan.

For the promotion of fish farming at community level, the department is working in association with five NGOs and community organizations.

5.9.1 Future Strategy

For the 21st century requirements, the department will adopt the following strategy.

1. Strengthening and up gradation of existing facilities of the department to increase fish seed production capabilities.
2. Utilization of untapped resources such as water logged areas in public and private sector.
3. Establishment of rain fed barrage fish pounds in the Barani areas.
4. Introduction of new varieties of fast growing and commercially important fish species.
5. Transfer of latest techniques of fish farming to the private sector to get the maximum benefit from their fish farms.
6. Implementation of effective genetic programme to improve the existing fish stock.
7. Formulation of commercial fish feed from local and cheaper ingredients.
8. Strengthening of research and training facilities to he private fish farmers.

9. Constraints of the department.
10. The existing facilities of the department are at least 15 years old and needs immediate renovation and remodeling in order to maximize their production efficiency.
11. Due to financial constraints and inadequate field staff, the department cannot provide enough extension services.
12. Due to limited incentives the private sector cannot be further motivated to establish fish farms.
13. The department has inadequate resources to create mass awareness at grass root level for further promotion of fish farming.

Chapter-6

Socio Economic Analysis of Sample Carp Fish Farmers

In the previous chapter No. 5 Fisheries situation in KP has been discussed. It was found that the Government was doing everything to improve fisheries situation in the Province. Beside it was encouraging that the private sector has been involved in this business. This chapter presents Socio-Economic condition of the Carp Fish farmers. We begin with the status of the literacy.

6.1 Literacy status

Table 6.1
Distribution of the respondents by literacy status

Literacy Status	Number	%
Yes	46	77.00
No	14	13.00
Total	60	100

Source: Field survey 2010-11

The data in the above table shows that many of the farms owners /operators were literate i.e. 46 out of 60 (77%) while only 14 (23%) were illiterate This trend in literacy indicates the fact that literacy may have good impact on productivity of the fish farming in the province.

Table 6.2
Classification of literate respondents by their level of education

Level of Education	Number	%
Up to HSSC	30	65.00
Above HSSC	16	35.00
Total	46	100

Source: Field survey 2010-11

The data in table 6.2 shows that out of the 46 literate respondents 30 had a level of education up to 12 years which is 65.0 % of the total literate while 16 (35%) gained education up to the graduate level or above.

The literacy status and level of education of fish farmers pin pointed that for the proper management of fish farming education not less than HSSC(12 years education) was essential. Those who were illiterate were, got help from literate assistants. In other words fish farming could be the profession of literates. Alternatively expressing that social background of the fish farmers was strong.

Table 6.3
Classification of the Sample Fish farmers by main occupation.

Main Occupation	Number	%
Agriculture	22	37
Govt. Service	14	23
Business	9	15
Fish Farming	7	12
Private Jobs	8	13
Total	60	100

Source: Field survey 2010-11

The farmers had other occupation too. Some had adopted fish farming as a part time job. Majority of the fish farmers had agriculture as their main occupation i.e. 22 of the total respondents which is of 37% of the sample respondent, some farmers have government services as their first occupation the total No. of such farmers is 14 out of the 60 sample farmers they constitutes 23% of the total sample farmers, 9 out of the 60 respondents i.e. 15% of the sample respondents shows that their main occupation is Business, 7 out of the 60 sample farmers shows fish farming as their main occupation i.e. 12% of each have fish farms and

8 out of 60 i.e. 13 % having private jobs respectively. All these shows that out of 60 sample fish farmers understudy only 7 or 12 % have adopted Fish farming as their main occupation or alternatively speaking fish farming was the subsidiary occupation of all the fish farmers as shown in the table 6.4

Table 6.4
Classification of Subsidiary occupation of the sample farmers in the Sample area

Subsidiary	**Number**	**%**
Fish farming	-	-
Agriculture	7	100
Self Business	-	-
Private Jobs	-	-
Govt Services	-	-
Total	7	100

Source: Field survey 2010-11

As shown in the previous table 6.4 that the main occupation of only 7 sample farmers was fish farming which was only 12% of the total farmers where as their subsidiary occupation is agriculture.

Table 6.5
Average monthly income (Rs.) of sample respondents in the sample area

Income range	Number	%
Up to 10,000/-	40	67
10,000-30,000/-	18	30
3,000-60,000/-	2	3
Total	60	100

Source: Field survey 2010-11

The data in table 6.5 shows that 40 of the 60 sample respondents i.e. 67% of the sample respondents have their average monthly income up to Rs. 10,000, 18 of the total 60 respondents i.e. 30 % have their average monthly income in the range of Rs. (10,000-30,000) and only 2 of the total sample farmers i.e. 3% of the sample respondents earn a monthly income in the range of Rs. (30,000-60,000).

Table 6.6
Family type of the sample Respondents of the sample area

Family Type	Number	%
Nuclear	24	40
Joint	36	60
Total	60	100

Source: Field survey 2010-11

60 % of the total of 60 fish farmers contacted in connection with this study, 36 or 60% lived in joint families and the remaining 24 which is 40 % were living in nuclear families as shown in the above table 6.6.

Table 6.7
Tenure status of house of the sample respondents in Sample area

Status	Number	%
Owned	56	93
Rented in	3	5
Free	1	2
Total	60	100

Source: Field survey 2010-11

The data in table 6.7 shows maximum of the sample respondents 56 out of the total sample farmers i.e. 93% sample farmers were living in their own houses, 3 out of 60 i.e. 5 % have rented in and only one respondent i.e. 2 % was living in free house. All the respondents are availing the facilities of electricity.

Table 6.8
Type of construction of the house of the Respondents in the Sample area

Type of construction	Number	%
Pacca	37	62
Kacha	13	22
Semi Pacca	10	16
Total	60	100

Source: Field survey 2010-11

The data in table 6.8 shows that 37 respondents out of 60 i.e 62 % of the respondents are living in pacca houses, 13 out of 60 i.e. 22% of the sample respondent is living in Kacha houses, while only 10 out of 60 i.e. 16% of the respondents are living in semi pacca houses.

Table 6.9
Source of water for irrigation purpose used by the Respondents Sample Area

Source	Number	%
Tub well	6	10
Canal	54	90
Total	60	100

Source: Field survey 2010-11

The data 6.9 shows that 10% of the sample farmers use tube well as a source of irrigation, while 90% used canals as a source of irrigation.

Table 6.10
Source of water for drinking of the sample respondents in the Sample Area

Source of water	Number	%
Water Pump	10	17
Hand Pump	35	58
Tub well	10	17
Committee Well	5	8
Total	60	100

Source: Field survey 2010-11

The data 6.10 shows that 10 out 60 respondents i.e. 17 % of the sample respondents have Water pump for drinking water, while 35 of the 60 sample respondents i.e. 58% were using hand pumps as a source of drinking water,10 out of the total 60 sample respondents were getting water for drinking from Tube wells which is only 17% of the sample farmers and 5 in numbers i.e. 8% used committee wells for drinking water.

Table 6.11
Adult family members of the sample respondent in the Sample Area

Adult	Number	%	Average size of House hold
Male	295	53.	5
Female	258	47	4
Total	553	100	9

Source: Field survey 2010-11

The table 6.11 shows that average size of the household is 9. The sample households have more men than women. The male female ratio is 5:4 i.e. the number of women per 100 total production are 47, which has been observed by this researcher.

Table 6.12
Total No of Households at the age group 16 and below in the Sample Area

Below 16 Years	Number	%age
Male	242	56
Female	190	44
Total	432	100

Source: Field survey 2010-11

The house hold members below 16 years of age constitute 78% of the total members in all 60 sample households (table 6.12). In this 56% accounts of male and 44.% accounts for female.

Table 6.13
Sex wise distributing of school going children.

At School	Number	%
Male	177	53.47
Female	154	46.53
Total	331	100

Source: Field survey 2010-11

Table 6.13 shows that the members at school account for 60 % of the total households members. The percentage for boys and girls are taken separately i.e. 53.47 % and 46.53 %respectively Table 6.13.

Table 6.14
Number of male family members of the households who are gainfully employed up to the age of 16 and above in the sample area

Gender	Number	%
Male	46	100
Female	-	-
Total	46	100

Source: Field survey 2010-11

The data in the table 6.14 shows that all students gainfully employed are male. There is no female involve up to the age of 16 years.

Table 6.15
Monthly income (Rs. of the gainfully employed people).

IncomeRange	Number	%
UP TO RS 2000	13	28.3
2100-4000	14	30.4
4100-6000	10	21.7
6100-8000	6	13.1
8100-above	3	6.5
Total	46	100

Source: Field survey 2010-11

The table 6.15 shows that there are 46 adult male members in the total house-hold members of 60 respondents who are gainfully employed in various occupations while none of the Female member of the house hold is employed. The monthly income of the above mentioned adult family members is given in the above table No. 6.15.

Table 6.16
Land Holding of sample Fish Farmers in the Sample area (Area in acres)

Tenure Status of the land	Irrigation Status	Small Farms (33)			Large farmers (27)			All Farms		
		Total Area	Average Area	%	Total Area	Average Area	%	Total Area	Averag e Area	%
Owner	I	359.83	17.21	53.02	5790	214.44	54.92	6185.83	123.72	88.42
	U	350.75	15.25	46.98	459	176.00	46.98	809.75	16.20	11.68
	Total	746.58	32.46	100	6249	390.44	100	6995.58	139.92	100
O-C-T	I	72	3.13	100	-	-	-	72	1.44	100
	U	-	-		-	-	-	-	-	-
	Total	72	3.13	100	-	-	-	72	1.44	100
Tenant	I	137	5.96	100	1363.5	50.5	79.15	1500.5	30.01	80.65
	U	-	-	-	359	13.30	20.8	359	7.2	19.35
	Total	137	5.96	100	1722.5	63.8	100	1859.5	37.21	100
Total	I	330.83	12.25	44.5	4426.5	163.94	97.8	4757.33	95.15	91.3
	U	350.75	15.25	55.5	100	3.70	2.2	450.75	9.02	8.7
	Total	681.58	29.63	100	4526.5	167.64	100	5208.08	104.17	100

Source: Field Survey2010-11

Table 6.16 is about the land holding of the sample fish farmers i.e. small and large farms by the fish farmers. According to the field survey, the total operated holding of the sample small fish farmers was 681.58 acres or the average total holdings of the farmers is 29.63 acres i.e. (own plus rented in – rented out). The figures for large farms shows that the total operated area is 4526.5 acres for all 27

fish farmers where as the average large farms holding is 106.74 acres. In all the total operated holding is 5208.08 acres and the average holding of the farmers in all categories is 104.17 acres.

Table 6.17
Land Under Fish Farmers in selected areas of sample area

Tenure Status of Land	Small Farmers	Average area of Large farmers	All Farmers
Area Owned	32.46	390.44	422.9
Area Rented in	3.13	-	3.13
Area Rented Out	5.96	63.8	69.76
Total Area Operated	29.63	326.64	356.27

Source: Field Survey 2010-11

The table 6.17 shows that the tenurial status of the farm holders and the farm owned by them. The total operated area in the category of small Farms held by small farmers is 29.63in which 32.46 acres belong to the farmers himself, 3.13 acres (average) has been rented in and the area rented out was 5.96 acres.

Average operated area held by the farmers in the category of large farms was 326.64 acres consisted of 390.44 owned by the farmers himself while some of the area i.e. 63.8 acres was rented out. Both small and large farm holding in the category of area owned is 356.27 while the same in the category of rented in and the area in the category of rented out is 69.76 acres.

Table 6.18
Annual income from different sources of the sample respondents the sample area(Rupees)

	Fish Farming		Agriculture		Live stock		Rent of land	
Income range	Number	%	Number	%	Number	%	Number	%
Up to 20,000			24	40	35	58	35	58
20000-40000	13	22	20	33	12	20	20	33
40000-60000	18	30	6	10	8	14	4	7
60000-80000	23	38	7	12	5	8	1	2
Above 80,000/-	6	10	3	5	-	-	-	-
Total	60	100	60	100	60	100	60	100

Source: Field survey 2010-11

The data in table 6.18 shows that there is no respondents who is earning from fish farming up to 20,000/-, 22% have annual income in the range of Rs. (20,000-40,000), 30% have annual income from fish farming in the range of Rs. (40,000-60,000), 38% have in the range of Rs.(60,000-80,000). And 10% having income of more than Rs 80,000/-.The data shows that from agriculture sector 40 % of the respondents having income up to Rs. 20,000/, 33 % from Rs. 20,000/- to 40,000/-, 10% from Rs. 40-60/ thousand and 17% are earning more than Rs. 60,000/- . Similarly,58% of the respondents have an annual income of up to Rs. 20,000/- from rent of the land , 33% from Rs. 20,000/- to 40,000/-, 7% from Rs.40,000/ to 60,000/- and 2 % are earning from Rs. 60,000/- to 80,000/- Rupees. The above table also shows that 91 % of the respondents are getting a handsome amount of about Rs. 40,000/- and only 9 % of the respondents are earning from live stock more than 40,000/-.

Table 6.19
Memberships with cooperative societies of the sample respondents in the sample area

Responses	Number	%
Yes	0	0
No	60	100
Total	60	100

Source: Field survey 2010-11

The data in table 6.19 shows that non of the sample farmer was the member of any cooperative society. They were getting guidance, technical advices, and other relevant help from the KP, Fishery Department.

Table 6.20
Type of assistance provided by Fishery Department in the Sample Area

Type of assistance	Number	%
General Training	60	100
Technical Training/ advices	60	100
Loans	6	12
Help in disease control	35	70

Source: Field survey 2010-11

The data shows among all the fish farmers all members i.e. 100% of sample respondents were provided general training about fish farming by the Fishery Department, all of them were receiving technical advices from this governmental organization i.e. only 6 of the total respondents were getting guidelines about the credit which is only 12 % of the total respondents. While 35 of the 60 respondents were receiving help about the diseases of the carp which is 70 % of the total as shown in the above table.

Chapter-7

ECONOMIC ANALYSIS OF THE SAMPLE FISH FARMS

In the previous chapter 6th of this study Socio Economic profile of the sample respondents of the carp Fish Farmers has been discussed. It was found that the socio Economic conditions of the Carp Fish Farmers are satisfactory. In the present chapter Economic and technical efficiency of the Carp Fish Farms has been analyzed. For the purpose of measuring Economic efficiency of the Carp Fish Farms, the Cost Benefit Analysis(CBA) method has been adopted.

Table 7.1

Type of Farm of the sample Respondent in the Sample Area

Type of pond	Responses	%
Pond Culture	60	100
Race Way	-	-
Total	60	100

Source: Field Survey 2010-11

There are two types of Farms i.e. pond culture and race ways. Pond culture is common in almost all the KP. Big ponds could be located in D.I.Khan where the land holding is large and the owner can afford to have big farms. Race ways are common in the valley of Swat, where the running water of the river is used for the purpose. As the research is confined to the Peshawar valley and D.I.Khan therefore it was found that all the 60 respondents are using pond culture and none is using race ways.

Table 7.2
Nature of Farm culture of the Sample Respondents in the Sample area

Nature of Culture	No	%
Mono culture	-	-
Mixed Culture	60	100
Total	60	100

Source: Field Survey 2010-11

The nature of the Farm culture is also of two types in the sample area. Some are using mono culture and the other mixed culture. Mono culture means the production of one type of Fish while mixed means producing the variety. In sample area during this study , it was found that all the sample respondents (100%) are using mixed culture and non of them is using monoculture.

Table 7.3
Type of specie produced by the sample respondentsin the Sample area

Specie	Average %age
Silver	15
Grass	15
Rahu carp	40
Mori	20
Common Carp	10
Total	100 %

Source: Field Survey 2010-11

Under mixed farm culture the type of fish produced are Rahu, Mori, Grass, Silver and Common carp. Under mixed culture specific ratio of the above mentioned type of fish are to be considered.

During the investigation it was found that all the farmers are using this specific ratio with respect to various types of fishes. The water of the pond is divided in to three layers these are surface layer, middle layer and bottom layer. Silver and grass carps are happy to live in the first layer called surface layer. Rahu fish species used to grow in the middle layer while Mori and Common carp enjoy the bottom surface of the water. The data shows that all the fish farms were properly

utilizing the water resource by using the mixed culture of the carp with a specific ratio given by the fishery Department i.e. 40% Rahu, 20% of Mori, 15% of grass & silver carp and 10% of the common carp.

Table 7.4

Total production and average production by type of specie in the sample area

Type of specie	Total Production (In kgs)	Average Production (In kgs)	%age
SILVER	56647	160	15
GRASS	56647	160	15
RAHU	151058	430	40
COMMON	37765	113	10
MORI	75529	220	20
TOTAL	377646	1083	100

Source: Filed survey 2010-11

The above data shows that in total of 377646 kg there were 56647 kg of each silver and grass, 75529 kg of Mori 37765 kg of common carp while 1,51,058 kg of Rahu was produced. The table also shows the specie wise average production of the fish i.e. per acre production of Rahu is more than any other specie which is 430 kg while the average production of Mori is the 2nd i.e. 220 kg, 160 kg for each silver and Grass and per acre production of common Carp is the lowest among all due to small proportion of the fries.

Table 7.5
Pond area and yield per acre by type of specie in the sample area

Type of specie	Pond area(Acres)	Yield per acre
Silver	356.27	160
Grass	356.27	160
Rahu	356.27	430
Common	356.27	113
Mori	356.27	220
Total	356..27	1083

Source: Field survey 2010-11

The above table shows that 356.27 acre of the area was used by 60 selected farmers from which the farmers produced 430 kg of Rahu and 160 kg per acre production each of Silver and Grass,220 kilograms of Mori and 113 kg of Common Carp.

Table 7.6
Selling price and total revenue/per acre by type of specie in the sample area

Type of specie	Selling price	Production/acre	Revenue	%age
SILVER	90	160	14400	15
GRASS	90	160	14400	15
RAHU	120	430	51600	40
COMMON	90	113	10170	10
MORI	90	220	19800	20
Total		1083	1,10,370/-	100

Source: Field survey 2010-11

Note: The selling price and the TR are only for the survey year

The above table shows the price of Rahu specie is Rs. 120/- which is more than all other specie due to the great demand for this specie which adds Rs. 51,600/- to the total revenue of 1, 10,370/- which is 40% of the total revenue, while 60% addition to the total revenue is made by all other species.

Table: 7.7
Total operating cost by type of specie in the sample area .

Type of specie	Total cost(Rupees)		%age
	CANAL	T/WELL	
SILVER	5700	7725	15
GRASS	5700	7725	15
RAHU	15200	20600	40
COMMON	3800	5150	10
MORI	7600	10300	20
TOTAL	38000	51500	100

Source: Field survey 2010-11

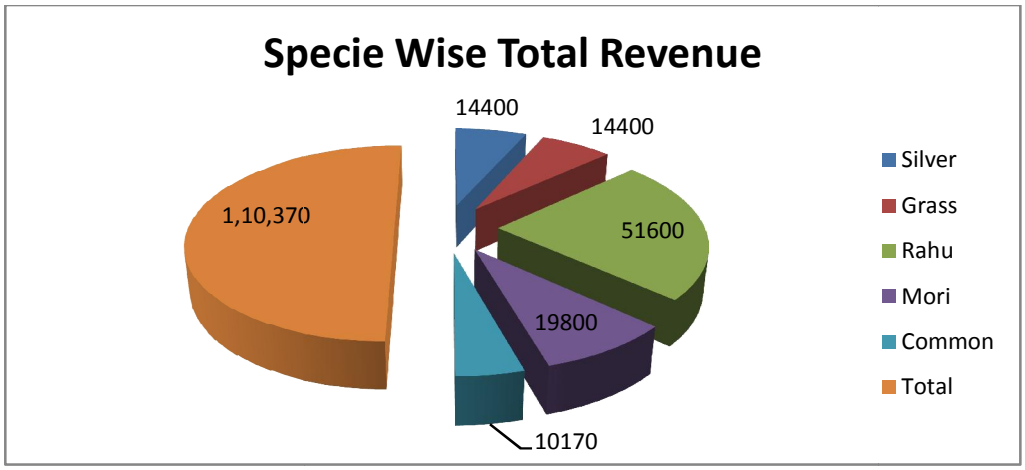
Note: The operating cost is measured for the survey year only.

Table 7.7 shows that the major portion of the operational cost is made on the production of Rahu i.e. Rs. 15200/- out of 38000/- if the farmer used canal water. The operational cost incurred on the production of Silver and Grass Carp is Rs. 5700/- each. The cost of Mori carp is 7600/- and Common Carp bear the cost of 3800/-. The table also depicts that the operational cost of the farmers using tube well for irrigation purpose is more as compare to the cost of the species under canal water**.**

Table: 7.8
Total net revenue of carp fish farming by type of specie during survey period

Type of specie	Total Revenue	Total Cost		Net Benefit		%age
		Canal	T/Well	Canal	T/well	
Silver	14400	5700	7725	8700	6585	15
Grass	14400	5700	7725	8700	6585	15
Rahu	51600	15200	20600	36400	30280	40
Common	10170	7600	10300	12200	8780	20
Mori	19800	3800	5150	6370	4390	10
Total	1,10,370/-	38000	51500	72370	56620	100

Source: Field survey 2010-11



The above table reveals that per acre net profit of the sample farms by type of specie. The table shows that Rahu specie contributes maximum portion of the profit i.e. Rs.36400/- which is 40% of the total profit of Rs. 72,370/-. While the Net benefit of the farms having tube well water for irrigation is 56620/- as shown in the bar diagram below:

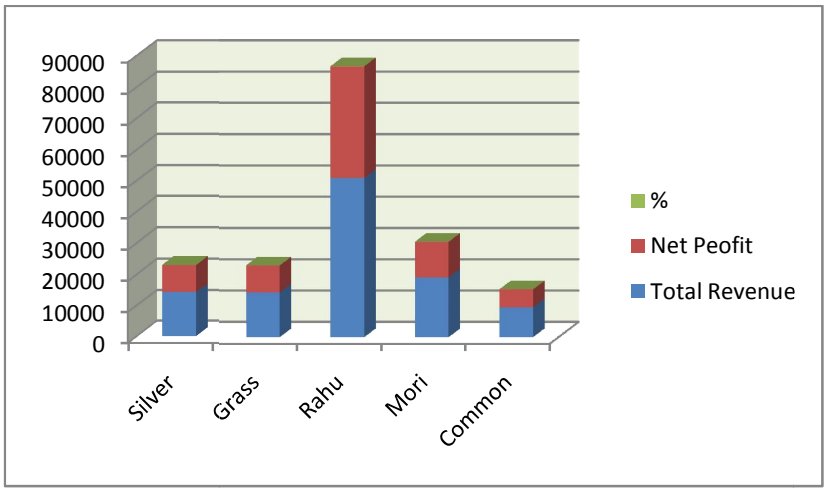


Table 7.9
Ownership status of the Farm in the sample area

Response	No	%
Own	53	88
Others	07	12
Total	60	100

Source: Field Survey 2010-11

The data shows that maximum of the respondents were the owner of the fish farms 53 of the 60 which is 88% of the sample respondents were the owners of the farms while 7 out of the total of 60 which is 12 % of the total respondents were the managers.

Table 7.10
Past use of the land now specified for ponds

Response	No	%
Agriculture	38	63
Fallow	22	37
Total	60	100

Source: Field Survey 2010-11

The data shows that 38 of the total sample respondents i.e. 63% of the sample respondents were using their land for agriculture purposes before the culture of fish farming and 22 of the total 60 sample respondents (37%) said that the land was fallow before the fish farming.

Table 7.11
Response of the Sample Respondents with respect to hatching of fish eggs

Response	No	%
Yes	06	10
No	54	90
Total	60	100

Source: Field Survey 2010-11

The table 7.11 shows that maximum of the sample respondents are purchasing the fries from other farms or fishery department. Only 6 respondents have the hatcheries. They are producing fish eggs for their farms.

Table 7.12
Source of Fish Eggs

Response	No	%
Own Breeding	6	100
From Others	-	-
Total	6	100

Source: Field Survey 2010-11

Table 7.12 shows that only 6 of the total respondents of 60 have their own hatchery i.e. (10%) have their own arrangement for Breeding.

Table 7.13
Source of supply of fry.

Responses	No	%
Fishery Department	50	93
Others	04	7
Total	54	100

Source: Field survey 2010-11

The data shows that all those respondents who lack their own hatchery and not hatching the eggs by themselves were getting the fries from the fishery Department and from private hatcheries.93 % and 7% were getting the fries from the fishery department and Private farms respectively.

Table 7.14
Demand Of fry of Sample Respondent in the Sample area

Response	No	%
Less than 1000	4	7
1001-2000	5	9
2001-3000	7	13
3001-4000	15	28
4001-5000	14	26
5001 and above	9	17
Total	54	100

Source: Field Survey 2010-11

The data in the above table reveals that demand for fries in the bracket of 3001-4000 is the highest (28%) followed by the bracket 4001-5000(26%). In the D.I. Khan District the size of the farms are large and their annual demand for fry is the highest. Demand for fry in the bracket of 5001 and above is also high. The demand for fry in the bracket of 3001-5001 is 71% of the total demand. This high demand for fry is due to the large size of the farm.

Table 7.15
Responses of the sample respondents with respect to the Size Of Fish Released by the farmers per acre in the Sample area

Size of the fry	Numbers	%
Up to 1 inch	6	10
1 - 1.5 inch	7	12
1.5 – 2	11	18
2 – 2.5 inches	25	42
2.5 – 3 inches	5	8
Above 3 inches	6	10
Total	60	100

Source: Field survey 2010-11

The above data shows that 10 % farmers were releasing the fry of the size of 1 inch, 12 % of the size 1-1.5 inches, 28 % of the size 1.5 - 2inches, 42 % of the size 2 - 2.5 inches, 8 % 2.5 – 3 inches, and 10 % of the respondents were releasing

the size of the fry above 3 inches in the ponds. It all depends on the objectives of the farmers. If the respondent wants for a quick marketing, he release big size fishes. But here the cost is also very high.

Table7.16
Responses of the sample respondents with respect to the availability of fryare sufficient.

Response	No	%
Yes	52	87
No	8	13
Total	60	100

Source: Field Survey 2010-11

The table shows that 52 of the total respondents (87%)are satisfied from the supply of fry, while only 8 of the 60 respondents showed their dissatisfaction with respect to the supply of fries which is only 13% were said that the supply does not meet our requirements.

Table 7.17
Responses of the sample farmers with respect to the application of fertilizer.

Response	No	%
Yes	60	100
No	0	0
Total	60	100

Source: Field Survey 2010-11

All the respondents answered in affirmative when asked about the use of fertilizer as it enhances production.

Table 7.18
Responses of the sample respondents with respect to Type of fertilizers Used by sample respondents

Response	No	%
Chemical	6	10
Organic	4	7
Both	50	83
Total	60	100

Source: Field Survey 2010-11

The table shows that 6 of the total were using only chemical fertilizer i.e. 10% of the fish farmers used chemical fertilizers, only 4 in numbers i.e. 7% of the total sample respondents used organic and maximum of the respondents were using both chemical and organic fertilizer which is 83% of the total sample farmers .

Table 7.19
Responses of the sample respondents with respect to credit taken

Response	No	%
Yes	5	8
No	55	92
Total	60	100

Source: Field Survey 2010-11

The table 7.19 indicates that 55 out of the total of 60 have not received any loan from any institution. Those who have not received any loan constitute 92% of the total respondents. Whereas only 8% of the total received loan during fish production.

Table 7.20
Responses of the sample respondents with respect to Source of Credit

Sources	Numbers	%	Interest rate
ADBP	2	40	15%
Commercial Banks	-	-	-
Money lenders	-	-	-
Friends/ Relatives	3	60	-
Total	5	100%	

Source: Field Survey 2010-11

As discussed in the previous table only 2 of the sample respondents managed to obtained loan from ZTBL at 15% interest rate and 3 farmers received loan from family members & friends without paying a single penny as interest. While the rest55 respondents have initiated and running the enterprise with their own finance.

Table7.21
Responses of the sample respondents with respect to problem in Credit in the area

	Numbers	%
Yes	-	-
No	5	100
Total	5	100

Source: Field Survey 2010-11

The data shows that all the two respondents were of the view that while obtaining credit from ZTBL and family members were facing no problem in getting loan.

Table 7.22
Classification of the Per acre Fixed cost of fish farmin the sample area

	Average cost (rupees)		
Item	**Canal**	**Tube well**	**Average of Both**
Cost of land	43,000	43,000	43,000
Labor cost	25,000	25,000	25000
Cost of building Material	14,000	14,000	14000
Transportation Cost	9,000	9,000	9000
Other costs	33,000	200000	1,16,500
Total	1,24,000	291000	2,07, 500

Source: Field Survey 2010-11

(The imputed value of the owners owns resources are included in the cost).

With respect to the one time fixed cost of the average Fish farm was Rs.1,24,000/- .. When farming was initiated was The cost of land(preparation of land, leveling and others) was estimated to be Rs.43,000/-, labour used in the construction of farm costs Rs.25,000/-, cost of building material was Rs. 14000/- while transport used for the purpose of establishing a Fish farm was Rs.9000/- where as the other costs on the construction of a Farm of the sample farmers was Rs.33,000/-. The average per acre cost of the farmers who had installed Tube wells is 2,91,000/-. The average one time fixed cost was Rs. 2,07,500/- as shown in the above table.

Table 7.23
Sources of Motivation

Response	**No.**	**%**
Family members	14	23.3
Friends	11	18.33
Fishery Department	35	58.33
Total	60	100

Source: Field Survey 2010-11

How the sample farmers started this business? The information plays a very important role in motivating someone to start a profitable business. Carp fish farming was not a common business in KP 20 years ago. But today we witness the increasing numbers of this enterprise. Thanks to the valuable information

regarding this profitable business throughout Pakistan. In the above table 7.23 the sample respondents were asked about the source of motivation for them to start this business. More than half of the respondent 58.33% indicates the positive role played by the fisheries department in this respect. Their pamphlets, of programs and direct contact with the local potential investors play a crucial role in motivating them for the establishment of this enterprise.

The table 7.23 shows that 14 of the total farmers i.e. 23.3% of the respondents were motivated by the family members for fish farming, 35 of the total sample farmers i.e. 58.33 % were motivated by the fishery Department, while the remaining 11 of the total sample farmers were motivated by their friends which is only 18.33 % of the total sample respondents.

Table 7.24
Provision of any help by any agency

Response	Numbers	%
Yes	48	80
No	12	20
Total	60	100

Source: Field Survey 2010-11

The table 7.24 shows that 48 out of 60 (80%) respondents answered in affirmative when were asked about the provision of help from any specialized agencies (fishery department) while 12 respondents have got no help. On inquiry they revealed that they have not asked for help but expecting that the fishery department will extend their help by themselves.

Table 7.25
Name of the agencies which provides help to the needy fish farmers in the Sample area

Name Of the Agency	No.	%
Fishery Department	42	84
ADBP	6	16
Total	48	100

Source: Field Survey 2010-11

As stated in the previous table (7.25) 48 out of 60 respondents has availed the

help of the agencies. On inquiry it was disclosed that 42 out of 48 are receiving help on continuous barriers from the fisheries department KP, while out of 48, 6 of the respondents have opted for help from Zari Taraqati Bank(ADBP).

Table 7.26
Future Expansion Plan of the sample respondents in the Sample area

Responses	No	%
Yes	50	83
No	10	17
Total	60	100

Source: Field Survey 2010-11

The table reveals that majority of the respondents are in favor of expansion if the government provides help & cooperation in the solution of the problems. Only 17% respondents are not in favor of any type of expansion.

Table 7.27
Response of the Sample Respondents With Respect to the problems of Fish Farm Culture in the sample area

	Yes		No	
	Number	%	Number	%
Designing of Pond		-	60	100
Layout of Pond		-	60	100
Installation of tube well		-	60	100
Others	5	8	55	92

Source: Field Survey 2010-11

All of the respondents are facing no problems in (i) designing of pond (ii) Layout of pond (iii) Installation of tube well (iv) Actual construction and supervision. Only 8% of the respondents responded that they have some financial problem.

Table 7.28
Response of the sample respondents with Respect to Training Received by Farmers in the Sample area

Response	No	%
Yes	7	12
No	53	88
Total	60	100

Source: Field Survey 2010-11

The table 7.28 reveals that only 12 % of the respondents received proper training and majority of the respondents received no proper training from any agency. The total number of such untrained farmer is 53 or 88%.

Source of Training.

As shown in the previous table 7.28, only 7 have received formal training and the training was about the feeding, diseases control and harvesting of fish.

Table 7.29
Technical Training Received by Sample Respondents in the Sample area

Response	No	%
Yes	7	12
No	53	88
Total	60	100

Source: Field Survey 2010-11

The data in table 7.29 shows that only seven respondents are receiving technical training which is only 112 % of the total sample respondents, while 53 out of 60 are not receiving any technical training from any department which is 88 % of the total sample respondents.

Table 7.30
Responses of the sample respondents with respect to Technical advice Received by Sample Farms

Response	No	%
Fishery Department	35	58
Neighbor	6	10
Other	7	12
None	12	20
Total	60	100

Source: Field Survey 2010-11

The data shows that 35 of the sample respondents i.e.58 % of the sample farmers received technical advice from fishery department, 6 of the sample farmers i.e.10% received technical advice from neighbor fish farmers and 12 out of 60 sample farmers which is 20% have not received any technical advice from any one.

Table 7.31

Response of the Sample Respondents With Respect to the Problems Faced by Sample Farmers in Fish Culture in Sample area

Response	No	%
Yes	39	65
No	21	35
Total	60	100

Source: Field Survey 2010-11

The table 7.31 Indicates that 39 i.e.65% of the total sample fish farmers of 60 faced problems in fish culture while 21 out of the total which is 35% did not faced any problems in fish culture.

Table 7.32
Type of Problems Faced by Sample Farms During Fish Culture.

Response	No	%
Input	10	26
Storage	17	44
Marketing	9	23
Credit	3	7
Total	39	100

Source: Field Survey 2010-11

Out of 39 respondents who faced problems during fish culture,26% pointed out problems with input purchase while 44% and 23% of them faced problems in storage and marketing respectively. While only 7% were facing problems about the credit.

Table 7.33
Response of the Sample Respondents with Respect to Normal Fish Catching Arrangements in the Sample area

Response	No	%
Drainage of pond	-	-
Hiring of Net	27	45
Hiring of Fishermen	19	32
Sell the Whole pond	17	23
Total	60	100

Source: Field Survey 2010-11

Hiring of Net is the popular method for catching fishes 27 out of 60 respondents are using this method for the purpose. This is done by the owner themselves. While 19 or 32% of the respondents, hires fishermen for this purpose and 14 of the total were selling the product in the pond on contractor which is 23 % of the total.

Table 7.34
Response of the Sample Respondents with Respect to Area under Fish Farms in Acres in the selected areas of D.I.Khan and Peshawar Valley

Area	No	%
Less than 1 acre	6	10
1	8	13
2	15	25
3	1	2
4	4	7
5	4	7
6	5	8
Above	17	28
Total	60	100

Source: Field Survey 2010-11

The individual share of the high farm with a total area of 6 acre and above is the highest i.e. 36%, followed by 25% having 2 acres of farm. The sample respondents then are farms, which are as same as one acre.

Table: 7.34-A
Distribution of carp fish farmers according to Farm size

Farm Size	Numbers	%
Small	29	48
Medium	14	23
Large	17	29
Total	60	100

Source: Field Survey 2010-11

Table 7.35
Response of the Sample Respondents With Respect to Fish Production Per Acre in the selected areas of D.I.Khan and Peshawar Valley

Production Years	800kgs	1000kgs	1200kgs	Total
2007-08	16 (27%)	14 (23%)	30 (50%)	60 (100%)
2008-09	9 (15%)	17 (28%)	34 (57%)	60 (100%)

Source: Field survey 2010-11

Note: Data in parenthesis shows the percentages.

Data collected from the s respondents during the survey, reveals that per acre production has been increasing with the passage of time. This is due to the technical and economic efficiency towards the process of production and marketing. The data in the table No7.35 indicates that approximately an average farm of one acre is producing 1083 Kg of fish and this production could be increased, if the problems indicated by the farmers are solved**.**

Table 7.36
Classification of the average production of all the sample Respondents of the Research area.

	Total Production (Kg)	Total Respondents No.
800Kgs	7200	9
1000 Kgs	17000	17
1200 Kgs	40800	34
Total	65,000	60
AverageProd:/ Year	65000/ 60	1083 kg per year

Source:Field Survey 2010-11

The above table shows the total production of the sample farms. The total no of the sample respondent are 60 and all of them produced fish amounting to 65000 kg per year.The table also indicates that average production of fish is 1083 kg.

Table 7. 37
Response of the Sample Respondent with respect toAnnual total Variable cost per acre of the selected farms of the sample area.

Items	0.0	Up to 1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-6000	6000-8000	30000 - 40000	Total
Fish seed	6 (10%)	-	27 (45%)	27 (45%)						60 (100%)
Fertilizer/ FYM				16 (27%)	14 (23%)	12 (20%)	18 (30%)	-	-	60 (100%)
Feed		-	-	10 (16.5)	10 (16.5)	3 (5%)	-	37 (62%)	-	60 100%
Labour		-	-	10 (16.6%)	13 (22%)	15 (25%)	12 (20%)	10 (16.6 %)	-	60 (100%)
Water Charges (Canal), T. well		-	33 (55%)	20 33%	-	-	-	-	7 (12%)	60 (100%)
Repair, Maintenance		-	50 (83%)	10 17%	-	-	-	-	-	60 (100%)
Others		31 (52%)	29 (48%)	-	-	-	-	-	-	60 (100%)

Source: Field Survey 2010-11

The above table shows the operating per acre cost of a fish farm. The breakup of the variable cost of each respondent is mentioned in the above table.

Table 7.38
Classification of Item Wise Operational Cost of the sample respondents of the Research area

Cost ⇒ Items ⇩	Rupees Canal	Tube well
Seed	2500	-
Fertilizer	5000	5000
Feeding	8000	8000
Labour	6000	6000
Waters	2000	18000
Harvesting	10500	10500
Others(Maintenance, Liming etc.)	4000	4000
Total	38,000/-	51500/-

Source: Field survey 2010-11

The above table shows items wise variable cost of the sample respondents. The total per acre operational cost of major items is Rs.38000/- per acre for canal water user. While the operating cost of the farms using tube well is Rs. 51500/- The fish farmer using tube Well for irrigation purposes have no cost on purchase of the fries as they have their own hatcheries. Their high cost is due to the electricity charges which are used for running the tube well.

Harvesting Period

Mostly the normal harvesting seasons is (October to February). But in D.I.Khan only one respondent was harvesting the fish in the month of March and he was earning more than the other farmers.

Current and Past Year Price

On average the current price per kg ranges from Rs 90/- to Rs. 120/-. The average price is calculated Rs. 105 per Kg.

Average Weight

The respondents said that from some fish farms the size and weight of a fish is about 0.5 kg, similarly the information were also received that the size of the fish at harvesting time is about .75- 1kg, and some farmers were getting the fish size having weight of more than 1kg. So it was observed that the normal weight of a fish at harvesting time is of 0.5-0.75kg.

Environmental Impact of Carp Fish Farms

The carp farms surveyed are of various sizes. They are small, medium and large constructed on various types of soils but mostly impermeable soils. The sources of water comprise of river water are supplied through canals, dug wells and tube wells. The amount of Inorganic and organic manure varies from pond to pond and area to area in terms of availability and economic cost. The pond water is not drained by most of the fish farmer. Only losses of water from seepage and evaporation is replaced which is at a very low rate.

Manure from various sources such as cattle farm, poultry farm, agricultural waste of vegetable etc; are being used as organic manure in these fish farms. This method of integration has proved to be an efficient means of solid waste disposal in a hygienic way and improvement of environmental conditions from reduction of fly and odor problems associated with livestock and solid waste disposal in most of the areas.

The recycling of the animal and farm wastes in the carp fish farming industry will go a long way in the improvement of the soil, air and water pollution. The nutrients will be conserved and recycled in the area rather than being washed away by the rain run-off into the river system and ultimately the sea. The organic detritus available in the fish pond bottom will also serve as an efficient fertilizer for growing of land crops- No adverse impact could be found on the environment of the fish farm surveyed.

Impact of Fish Farming on living standard

Earning of livelihood is positively related with Fish farming. Maximum fish farmers have increased their earnings and food with fish farming. The farmers fulfil their all basic needs by this sector. The study suggested that majority of the farmers have developed their socio Economic Condition with fish farming, now they have food, clothing, better living condition and they use to send their children to school. Saving, investment and their purchasing power has increased while unemployment has decreased. Fish farming sector plays an important role in improving the Scio Economic condition of the selected samples and it creates employment opportunity, increasing the food production and eradication of poverty. The profitability can be increased if proper training is given to the farmers and financial credit is given to the farmers on easy terms and conditions.

Chapter-8

OUTPUT FUNCTIONS AND VIABILITY OF CARP FISH FARMING

This chapter is divided in to two parts. The first part is devoted to estimate the regression models or output function for Carp fish , while the 2nd part examines the viability of carp fish farming in the province

8.1 MODELS FOR OUTPUT OF CARP FISH FARMING.

This subsection focuses on the specification, estimation, and verification of econometric models i.e. the production functions, which indicated the relationship between the output of carp fish and inputs. There were various factors which influenced the level of output of carp fish but for the purpose of this dissertation the key factors were used . For comparison the different Econometric Models for small farms, medium farms and large farms were estimated.

8.1.1 Specification of Models

It was assumed that all other factors remaining unchanged. The output of Carp fish "Qf" was significantly affected by the total farm pond area(in acres) "PA" irrespective of the tenurial status and other considerations associated with land, Total number of fries, "NF" and the total monetary value of consumable inputs (like feeds, labour, and electricity etc) and capital assets (like sheds, ponds, vehicles and other implements etc.) "KCA". So far as the mathematical form of the model for the determination of the rate of change in the output of carp fish with respect to the identified determinants was concerned the following linear production function was used.

$$Qf = \beta_0 + \beta_1 PA + \beta_2 NF + \beta_3 KCA + Ui \text{ ----------Eq-I}$$

In addition to this linear production function to ascertain the output elasticities of the major inputs , area under ponds "P" and total capital "K", the Cobb-Douglas production function of the type

$$QF = AP^{\alpha} K^{\beta} e^{ui}$$ ----------Eq- II

was used where "QF" was the output of carp fish , " P " was the pond area(in Acres) and "K" was the Capital(Fixed and working capital in Pakistani Rupee), the co- efficient parameter "A" shows the impact of innovation/ technology used for the production of carp fish. The greater is the value of " A" the more advance is the technology and vice versa. The parameters "α" and "β" are the output elasticities of the inputs "P" and "K" respectively. The expected signs of the estimated output elasticities may be positive and their individual expected magnitudes are less than unity. The sum of these elasticities also helps in the assessment of stage of returns to scale.

8.1.2 Estimation of the Models

The linear production function (Eq.I) contains single equation and it was assumed that there was no autocorrelation between the residual term U_t and U_{t-1}, no Hetroscadesityand no Multico linearity among the explanatory variables, hence the Ordinary Least Squares(OLS) method was used for the estimation of parameters "βi". It was also assumed that the parameter estimates posses the "BLU"(Best, Linear, Unbiased) properties. In case of Cobb-Douglas production(Eq.II), it was first converted to the log-linear form as follows:

$$LnQ = LnA + \alpha LnP + \beta LnK + Ui$$ ----------Eq-III

and then it was estimated applying the OLS method with its usual assumption and BLU properties.

For the sake of comparison among different farm sizes (Viz. small. medium, and large) three different functions in linear and Cobb- Douglas forms were estimated with the help of SPSS package.

To ascertain, the overall influence of explanatory variables on the output of carp fish collectively in all farm sizes, a pooled function was also estimated. The summary of results is presented in the following tables 1, and 2, respectively.

8.1.3 Specification of small, medium and large Farms

Fish farms are categorized in to small, Medium and Large Farms according to the area under the farms. Farms having pond area up to 2 acre of land are considered as small farmers, farms having area for farm from 2.1 – 6 acres are called medium and farms having area for fish farming is more than 6 acres are called large farms ,

Table-1

Estimated Linear production functions for Carp Fish by farm size

a) Small Farms No: of Farms= 29

$Q_F = 3.61\ F_A + 0.91 N_F + 1.92\ KCa$

(1.31) (0.07) (0.93)

T Test = 2.75 13 2.06

$R^2 = 0.74$ F- Ratio = 88.58 $\sum e^2 i = 66.83$

b) **Medium Frams No: of Farms=14**

$Q_F = 3.81\ F_A + 0.96 N_F + 2.04\ KCa$

(1.14) (0..13) (1.07)

T Test = 3.3 7.38 1.90

$R^2 = 0.79$ F- Ratio = 89.14 $\sum ei^2 = 67.5$

c**) Large Farms No: of Farms=17**

$Q_F = 3.97\ F_A + 0.99 N_F + 2.76\ KCa$

(1.85) (0.44) (1.00)

T Test = 2.14 2.25 2.76

$R^2 = 0.78$ F- Ratio = 88.96 $\sum ei^2 = 60.11$

d) **All Farms No: of Farms = 60**

$Q_F = 3.76 F_A + 0.95N_F + 2.83 KCa$

(1.12) (0.84) (0.99)

T Test = 3.36 1.13 2.85

$R^2 = 0.76$ F- Ratio = 99.15 $\sum ei^2 = 64.16$

Source: Field survey

Note: Figures in parenthesis are the respective standard errors.

Table : 2

Estimated Cobb Douglas production by Farm size

a) Small Farms

$Q = 8.13 P^{.63} K^{.61}$

$R^2 = 0.85$ F-ratio= 115.53

b) Medium Farms

$Q = 9.00 P^{.71} K^{.69}$

$R^2 = 0.91$ F- Ratio = 107.14

c) Large Farms

$Q = 9.18 P^{.73} K^{.64}$

$R^2 = 0.88$ F- Ratio = 109.12

d) All Farms

$Q = 9.65P^{.68}K^{.59}$

$R^2 = 0.88$ F-Ratio= 109.12

Source: Field survey.

8.1.4 Evaluation / Tests of the Model:

The table no: 1 reveals that almost all the standard errors of the parameter estimates were less than the half values of the estimators, which implies that the estimated parameters were statistically significant. This conclusion is supported by respective "t" ratios with 5% level of significance. The "t" ratios were calculated by following expressions:

$$t = \frac{\hat{\beta}}{S(\hat{\beta})} \quad \text{with (n-k) degree of freedom}$$

The co-efficient of multiple determination "R^2" of all estimated models were greater than 50%, therefore the fits were good. The pooled model of linear production function(Eq: I) showed that 76% variations in the production of Carp fish were explained by the explanatory variables , which implies that the repressors of the model were the important determinants.

The calculated values of F-Ratios in all cases were very high, which suggested that the estimated production functions were overall statistically significant.

8.2 Analyses of the Models

The results of the estimated production function (Table I) indicate that the signs and magnitudes of the parameter estimates were consistent and according to the expectations. The rates of change in the production of carp fish farm with respect to change in pond area were 3.61, 3.80, 3.97 on small, medium and large farms respectively. It was 3.76 in case of all farms (pooled function). The impact of per unit change in the total number of fries on the production of carp fish was 0.95 on all farms. Table -1 reveals that the rate of change in output due to the change in input " capital" "KCA" is 2.83 on all farms. The results of the linear production show that the influence of total area of ponds was relatively higher than the influence of fries and capital.

The results of estimated Cobb-Douglas production function (presented in table 2) were also according to the expectation on the economic priory basis. The output elasticity of pond area was 0.68 on all farms, which was relatively higher than the

output elasticity of Capital (i.e.0.59), where capital also includes the cost of fries purchased. This model also suggested that area under ponds plays a vital role in the output of carp fish.

Since the sum of output elasticities of the key inputs (i.e. $\alpha + \beta$ or 0.68+.059 = 1.27) was greater than unity. Hence it implies that there were increasing returns to scale on all farms. The stage of increasing returns to scale means that there was a significant room to enhance the output by employing additional units of key inputs.

It is important to note that no significant difference was found between the output elasticities on small, medium and large farms.

While comparing the estimated linear Models for small and medium fish farms, the chow F-Ratio suggested that there is no significant differences between the small and the medium. The same situation is observed between the models of medium and large farms. However the result evidenced that the difference between the models for small farms and large farms were slightly significant.

From the co efficient "A" of the estimated Cobb-Douglas production functions, for small, medium and large farms i.e. 8.13, 9.00, and 9.18 respectively. It can be concluded that there was no technological gap between three farm sizes. In other words the small, medium and large farmers operated their farm at the same production lines, all being in the stage of increasing returns to scale having provision for improvement of efficiency in the production of carp fish.

8.3. Marginal Physical Products of the Key Inputs

By Marginal Physical Product(MPP) , we mean the addition of Carp fish output to the total level of output by the marginal or an additional unit of input. The MPP's of various inputs were calculated using the following partial differentiation formula with respect to each input.

$$\text{MPPp} = \partial / \partial p\,(Q) = \partial / \partial P(AP^{\alpha} K^{\beta} e^{ui})$$

$$\text{MPPk} = \partial / \partial K(Q) = \partial / \partial K(AP^{\alpha} K^{\beta} e^{ui})$$

Using the above estimated production function , the mean values of pond area "P" and capital "K" were substituted in different partial derivatives and the numerical Values of Marginal Physical Products (VMPP) of both the key inputs were calculated and presented in the following tables-3

Table-3

Values of Marginal Physical Products of the key inputs by farm size

Key Inputs	Farm Size			
	Small Farm	Medium Farms	Large Farms	All Farm
i) Pond Area"P"	4.03	3.94	2.06	3.05
ii) Capital "K"	2.16	2.67	3.73	3.04

Source: Calculations were based on table -2

The table reveals that in case of all farms, the marginal physical products of both the key inputs were more or less the same. But the results on different farm sizes were very interesting, the VMPPs of Pond "P" diminishes as the farm size increases the corresponding values on small, medium and large farms were 4.03, 3.94, and 2.06 respectively. On the other hand the VMPPs of Capital input "K" increased with an increase in the farm size. The relevant figures recorded on small, medium and large farms were 2.16, 2.67 and 3.73 respectively.

It was observed that the VMPPp and Farm size were inversely related, but the $VMPP_k$ were directly related to the size of the farm. This implies that when the size of pond is small then one additional unit of pond area might add more to the total output of carp fish as compared to the one additional unit of capital. Contrarily in case of large size of pond, one additional unit of capital (purchase of fries , feed, and labour etc.)might add more to the total output of carp fish than the contribution of additional unit of pond area. From the observed VMPPs, it is concluded that the efficiency ofland use might be enhanced by increasing the area of pond land on the small and medium farms, on the other hand, it could be improved by increasing the amount of capital on large the farms.

8.4 Viability Of Carp Fish Farming Using The Npv, Bcr And Irr Criteria Of Investment

It was observed that the project life is approximately 20 years. Although some projects lasted for more than this period. However the three most important investment criteria, Net Present Value(NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return(IRR) were used for testing the viability of Carp Fish Farming in the Province. The calculations were based on the following table:

Table 8.4

Necessary calculations for NPV , BCR and IRR

Years	Time	Fixed Cost	Operating Cost	Total Cost-	Total Revenue	Net Benefit	D.F 12%	NPV 12%
1989	0	124000		124000	0	-124000	1	-124000
1990	1		30029	30029	44000	13971	0.893	12476.103
1991	2		30958	30958	45500	14542	0.797	11589.974
1992	3		31916	31916	47000	15084	0.711	10724.724
1993	4		32903	32903	47250	14347	0.635	9110.345
1994	5		33921	33921	48000	14079	0.567	7982.793
1995	6		34970	34970	49000	14030	0.506	7099.18
1996	7		36052	36052	50000	13948	0.452	6304.496
1997	8		37167	37167	53000	15833	0.404	6396.532
1998	9		38317	38317	58000	19683	0.361	7105.563
1999	10		39502	39502	61000	21498	0.322	6922.356
2000	11		40724	40724	61000	20276	0.287	5819.212
2001	12		41983	41983	61900	19917	0.256	5098.752
2002	13		43281	43281	63000	19719	0.229	4515.651
2003	14		44620	44620	68900	24280	0.204	4953.12
2004	15		46000	46000	74200	28200	0.182	5132.4
2005	16		47380	47380	79500	32120	0.163	5235.56
2006	17		48801	48801	84800	35999	0.146	5255.854
2007	18		50265	50265	90100	39835	0.13	5178.55
2008	19		51772	51772	95400	43628	0.116	5060.848
2009	20		53325	53325	111300	57975	0.104	6029.4
								13991.413

Source: Field Survey (2010-11)

The undiscounted Net Benefits in Colum 6 of the above table show that the fish farming sector was either in loss or earning a very nominal benefit in the initial stage due to high cost of land and construction cost. But with the passage of time the efficiency of the carp fish farms was improving due to gaining of experience and increase in the demand of the fish. This increase in demand pulled the prices of the Fish which increased the total revenue of per acre Fish Farm. The net Cost and benefit were discounted at the discounted rate of 12%(The rate at which the State Bank of Pakistan offered loan to commercial Banks). For the calculation of discounting factors at the social discount rate r=12% and the time period "t"(Where t=0,1,2,3-------20 years),the following expression was used:

$$D.F = 1/(1+r)^t$$

The relevant values are shown in the last column 8 of the above table 8.4

8.5. The Net Present Value (NPV) Criterion:

The Notion "Money has a time value" plays an important role in the determination whether a project is worth to accept or reject. The NPV though an absolute measure of project worth, however it is very frequently used in the accept / reject decision making. In this case the undiscounted net benefits (Total revenue minus total cost) i.e. Bt-Ct were multiplied by the discounting factor for each year and the discounted cash flow was summed over all years of project life. The following formula was used:

$$NPV = \sum_{t=0}^{n} \frac{Bt - Ct}{(1 + r)^t}$$

The observed value calculated by the above expression was Rs. 13991.41. Since NPV of the Carp Fish Farming was positive and was a handsome amount in discounted term, hence the Carp Fish Farming in KP Province was a viable Project.

8.5.1 The Benefit Cost Ratio Criteria:

The viability of the carp fish farming was also tested using the Benefit Cost Ratio criterion.

The formula used for the Benefit – Cost Ratio was as follows:

$$BCR = \sum \frac{Bt}{(1+r)^t} \Big/ \sum \frac{Ct}{(1+r)^t}$$

BCR= 410612.55 / 396621 = 1.03

For calculating the benefit cost ratio the discounted total revenue was divided by discounted total cost. The result which is obtained is 1.03 which is greater than unity (i.e.1.03 > 1). Therefore it is concluded that the fish farming sector is beneficial and worth to accept. That is fish farming sector is a viable project.BCR is a relative measure of a project worth. BCR=1.03 means that if a fish farmer invests one unit of money (e.g.Rs.one million) as a result the farms operator will get 1.03 units(Say Rs. 1.03 millions).

8.5.2 INTERNAL RATE OF RETURN

For examining the viability of the sector another effective technique of Internal Rate of Return was used. For computing IRR the NPV's at different discounted factors were calculated, and the selected two discounted rates(12.5 % & 13.%) at which the NPV's(9019.011 and -16439.8) were obtained. The IRR is then calculated using the following formula:

$$\left[IRR = (lower\ Discount\ rate) + (Difference\ between\ the\ two\ rates)\left(\frac{NPV\ at\ lower\ discount\ rate}{\left| Difference\ between\ the\ two\ NPVs \right|} \right) \right]$$

IRR = 12.5+.5(9019.1)/(9019.15-(-16439.8)

IRR = 12.5 +.5(9019.1/25458

IRR = 12.67

IRR = $12.67 \geq 12$ %

The result shows that IRR of the enterprise was 12.67 % which is compared with the Social discount rate of 12%. Since IRR is greater than the Opportunity Cost of Capital, hence the enterprise was a profitable and it is beneficial for the fish farmers.

All of the three techniques which were used for the acceptability of the enterprise clearly showed positive sign about the continuity of the enterprise. NPV, BCR and IRR resulted the Carp Fish Farming under canal water is viable and beneficial project in the province of KP.

In case of fish farming under Tube well although got a positive net income of Rs. 56620/- per Year per acre because of practicing selling price higher than the average market price, being able to afford the total operational cost, since the total production cost could not be covered. The positive financial net income indicates a short term return. However, the long term profit is not feasible because of the non-availability of the relevant data regarding their revenue from selling of fish seed. It could not afford the total production costs.Investments, expenses and incomes are relative to the outputs from the beginning of the fish farm.

Chapter-9

MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

(9.1) Main Findings.

The main findings of this exercise are summarized as follows:

- 7% of the fish farmers are literate out of which 65% have got education up to HSSC while 35% have got education above higher Secondary School Certificate.
- 12% of the fish farmers are using fish farming as primary occupation while 88% consider as secondary occupation.
- 60% of the respondents are living in joint family system, 93% of the sample respondents have their own houses for living.
- Majority fish farmers use canal as a main source of irrigation
- Male/Female ratio of all family members of the 60 sample respondents is 1.14 : 1.00
- 26% of the total fish farmers earn Rs.20- 40 thousands,46% earn within the range of Rs. 40-60 thousands, while 28% earn above Rs. 60, 000/ per year per acre from fish farming
- All the fish farmers adopt pond culture for farming and follow the mixed culture strategy for fish farming.
- 100% farmers cultured Silver, Grass, Rahu, Mori and Common carp in specific Ratio i.e. 15%, 15%, 40%,20% and 10% respectively.
- Total pond area used by all the fish farmers is 356.27 acre, and the average area for fish farm is 5.94 acre.
- The specie wise per acre production of Silver, Grass, Rahu, Mori and common is 160kg, 160 kg, 430 kg, 113 kg and 220 kg respectively.
- The average per acre production is 1083 kg.

- It is found that the total per acre revenue of pond under canal water is Rs. 1, 10,370/-while the cost per acre is Rs.38000/- the net benefit of which is Rs. 72, 370/- and the net benefit of a tube- well irrigated farm is Rs. 56620/-.
- 88% of the respondents were the owner of the farm while only 12% respondents were the manager of the Fish Farms.
- 63% of the respondents were using this land for agriculture purposes while 37% utilized the fallow land in the profitable alternative.
- Only 10% were hatching the fish eggs, while 90% were purchasing fries from other sources.
- 93% were purchasing fish fries from Fishery Department while 7% were purchasing it from Private hatcheries.
- 40% respondents were releasing fries of the size up to 2 inches, 42 % were releasing the fry of the size 2-2.5 inches, where as 18% were releasing the fries of the size 2.5- and above.
- 87% of the respondents were satisfied from the supply of fish fries.
- 83% respondents were using both chemical and organic as fertilizer.
- One time fixed cost of per acre fish farm is 1,24000/-
- 58% of the farmers were motivated by the Fishery department.
- 83% of the fish farmers are thinking for the expansion of the fish farm.
- 58% respondents are seeking help from fishery department.
- 65% farmers were facing problems of storage, inputs, marketing and credit.
- 43% of the total respondents were using above 5 acres of land for fish farming, while 34% were using 2-4 acre and 23% were using up 1 acre for fish farming.
- The NPV is + 13991/-, BCR is 1.03> 1, and IRR is 12.67%> 12%
- All these criteria show that the fish farming is a viable business.

9.2 Conclusions, Suggestions And Recommendations.

Benefits based on the value of the indicators in this study, fish production is financially and economically Viable & beneficial. The Sum of marginal Physical productivity of the Pond area and the capital shows that there is increasing return to scale ($\alpha + \beta = 0.68 + .59 = 1.27 \geq 1$).

It is also concluded that almost all the hypothesis are proved to be true and accepted. As growth in fish farming has been observed at national as well as at provincial level and the actual level of output is observed to be lower than the required level of production. Hypothesis number three is rejected as the socio economic condition of the fish farmers is observed up to the standard. This enterprise can absorb more resources, labour and other factors of production. The Fish farming sector improves the quality of life, create jobs and improve the sources of income generation.

Keeping in view the findings of the study, the following policy recommendations should be made:

1) Adequate training program for fish farmers should be conducted.
2) Most of the fish farmers belong to poor family they have little access to finance. Therefore, government should help the farmers by providing them adequate finance where needed.
3) The Fishery sector should help the farmers to purchase inputs and sale the product.
4) The weather of KP is tough but there is no proper storage facility. This sector may be developed if the government provide proper storage facilities to the farmers.
5) The other segment of Carp Fish farming is fish farming irrigated by tube well. More and more people can be attracted if proper finance should be made for the installation of Tube well or dug well and electricity is provided on subsidized rate.
6) Due to time, financial constraints and security problems in the sample areas I could not reach to dig out the diseases faced by Fish Farming. I feel this sector needs more attention and more extensive studies about the diseases, the cause of diseases and how to prevent carp farming form bacterial attack and to avoid the losses of the resources.

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APPENDIX I

QUESTIONNAIR

Part I

General

(FISH FARMERS/FISHERMAN/VENDOR)

I. PARTICULARS OF RESPONDENT

1. Name_____
2. Address_____
3. Literacy status
   a. Literate _____ Highest Exam. Passed_____
   b. Illiterate_____
4. Occupation
   a. Main _____
   b. Subsidiary _____
5. Who is the Employer (Main Occupation) ?_____
6. Average Monthly Income from Main Occupation: Rs._____
7. What was your previous Main Occupation ?_____
8. Why did you leave your previous Main Occupation ?_____

II. FAMILY INFORMATION

1. Family Type: a) Nuclear _____ b) Joint _____
2. Household Size and Composition:

Particulars	Number
i. Total Members:	
a) Males	
b) Females	
ii. Below 16 Years of age:	
a) Male	
b) Female	
iii. At School:	
a) Males	
b) Females	

Family Members Gainfully Employed, other Than The Respondent:

Particulars	Number	Average of All	Monthly Workers	Income
i. Below 16 Years of age:				
c) Male				
d) Female				
ii. Adults:				
a) Males				
b) Females				

3. Family Members Working Abroad (only those members who) regularly contribute financially to the family):
   i. Number:_____ ii) Country (s) in which working ___

III. 1. LAND HOLDING:

Ownership Status of Land	Area (Jareeb)		
	Irrigated	Un-Irrigated	Total
i. Owned ii. Rented in iii. Rented Out iv. Not Operated			

2. Land Use (of Operated Holding)

	Total Area	Irrigated Area	Source of Irrigation
i. Land under fish farm			
ii. Other crops/orchards			

IV. OTHER INFORMATION

1. Are you a member of any Cooperative Society? Yes No

   If yes, please give the following information

   a) Name of Cooperative Society

   b) Location

   c) Main Functions

2. Has this Society helped you in the establishment of you fish farm/any other activity concerning fishing?

   Yes No

If Yes, please give the type of assistance received from the above named Society.

a)

b)

c)

3. Tenure status of the house in which currently residing:

Status	Whether Electrified		Type of Construction		
	Yes	No	Pacca	Semi Pac	Kacha
Owned Rented in Free					

4. Do you possess animals? Yes No

   If yes, is there a special shed for the animals in your house?

   Yes No

5. What is the source of your drinking water?_____

6. What kind of energy you normally consume at home?

   -Electricity, -Wood, -Coal, -Kerosine Oil, -Gas/LPG

7. Your income from occupations other than that given in I.6.

Source	Annual Income
i. Fishery:	
ii. Agriculture	
iii. Livestock Products	
iv. Rent of Land and Property	

v. Remittances:
   a. Home
   b. Abroad
   c. Total

vi. Other Sources (Please Specify Below)
   a.
   b.
   c.
   d.

Part – II

(For Fish Farmers)

1. Type of fish farm

Type of Farm	No	Size	Area (Kanal)	Nature of Culture		Specie	No
				Mono	Mixed		
i. Pond Culture ii. Raceways iii. Any Other							

2. Date of:

i. Establishment _____

ii. Commencement of Production _____

3. How was this land used previously? i.e. before the establishment of Fish Farm.

4. Cost of Construction of the Farm (fixed cost)

i. Cost of Land_____

ii. Labour Cost_____

iii. Cost of Building Materials _____

iv. Transport _____

v. Other Costs _____

vi. Total Cost _____

5. What/Who motivated you to start this farm?

6. Did any agency provide you any help, guidance, etc. in establishing this farm?

No Yes Name_____

7. Are you thinking of expanding your farm? Yes No

If yes, what improvement or expansion do you plan?

8. Who owns the farm?_____

9. Who manages the farm ?_____

10. Do you hatch fish eggs? Yes No

11. If yes, where from do you get fish eggs and at what rate?

12. If No, who is the source of supply of fry?

13. What is your total demand/requirement of fry?
14. When was the current marketable fish released in the pond?
15. Give the following details:
    i. Number of seed released

    ii. Size

    iii. Number per acre
16. Is the available fry sufficient to meet your requirements?

    Yes No
17. If the available supply of fry is not sufficient to meet your reqrement, then how do you meet your requirements.
18. Do you apply fertilizer? Yes No
19. If yes, what fertilizer do you use?

    Chemical_____ , Organic _____, Both_____
20. Have you taken any credit for your fish farm?

    Yes No
21. If yes, please give the following details/

Source	Amount Borrowed	When	For What Purpose	Terms & Conditions of Credit
i. SDBP				
ii. Comm. Bank				
iii. Money Lenders				
iv. Relatives				
v. Friends				
vi. Others (Pl. Sp.)				

What problems do/did you face in obtaining credit from different sources?

Sources of Credit	Problems Faced	Suggestions for Improvement
i. ADBP ii. Comm. Bank iii. Vendors iv. Any Others		

22. What problems do/did you face in respect of the following?
    i. Designing of pond/raceways
    ii. Layout of ponds/raceways/buildings
    iii. Installation of tubewells (if any)
    iv. Actual construction
    v. Supervision
    vi. Other if any
23. Where are the fish normally harvested?
    Month/Season _____
24. What is the sale price per kg. ?_____
    i. Currently
    ii. Last Season
25. What is the size/weight of fish normally harvested? _____
26. What was the production during 1997-98 and 1996-97 (quantity in kg.)
    And value in Rs.)?

Species	1997-98	1996-97
i. ii. iii. iv. v. vi.		

27. Have you received any training in aquaculture? Yes No

28. If Yes, please answer the following:

a) Place of training_____

b) Subject of training _____

c) Duration of training _____

29. Do you receive technical advice on aquaculture from the concerned expert/extension staff of the Government from time to time?

Yes No

30. Do you have any problem in fish culture?

Yes No

If yes, please mention the problems:

a) Input (fish fry, fertilizer, credit, etc.) _____

b) Storage_____

c) Marketing_____

d) Other (Pl. Specify)_____

31. Operating Cost

Item of Cost	Unit	Quantity used		Price Per Unit	Unit	
		Total	Purchased		Total	Imputed
I. SEED a. Trout i. Eggs ii. Fry iii. Fingerling II. CARP a) Rohu b) Mori c) Thaila d) Grass Carp						

e) Silver Carp
f) Common Carp
g) Any other

III. FERTILIZER

a) Organic
   i. Farm yard manure
   ii. Poultry dropping
b) Inorganic
   i. Urea
   ii. Di-phosphate/Super-phosphate
   iii. Ammonium Nitrate
   iv. Sulphate
   v. Potassium
   vi. Nitrate
   vii. Any other

IV. FEED

a) Fish meal
b) Meat meal
c) Bone meal
d) Corn glutein meal
e) Rice bran
f) Rich hush
g) Rich polish
h) Wheat bran
i) Maize
j) Vitamins premix
k) Any other

V. LABOUR

a) Hired Labour
   i. Permanent Labour
   ii. Temporary/Seasonal labor

b) Family Labour

i. Full time

ii. Part time

32. What are your normal fish catching arrangements?

a) Drainage of pond_____, b) Hiring/purchase of nets_____ _____,

b) Hiring fishermen/labour_____, d) Any other _____ _____.

33. Fish output and disposal (Last season)

Sale through	Species							
	Specie	Amount	Specie	Amount	Specie	Amount	Specie	Amount
a. Commission agent b. Consumers c. Other (Pl. Sp.)								
Total Sales								

a) Sold Locally

b) Sold in other place

Other crops sown and their production during 1991-92.

Crop Grown	Area Under Crop	Total Production (md.)		Wholesale price at harvest time
		Main Prod.	By-Prod.	
1. 2. 3.				

4. 5. 6. 7.
All Crops

34. Do you wish to give information/your views on an aspect of which is not covered by this questionnaires?

    Yes No

    If Yes, then please give your views.

APPENDIX II

NET PRESENT VALUE

BENEFIT COST RATIO

INTERNAL RATE OF RETURN

NET PRESENT VALUE

DISCOUNTED RATE = 12%

TABLE I

Classification of the total repsondents about the NPV in the Sample area

Years	Time	Fixed Cost	Operating Cost	Total Cost-	Total Revenue	Net Benefit	12%	NPV 12%
1989	0	124000	0	124000	0	-124000	1	-124000
1990	1		30029	30029	44000	13971	0.893	12476.103
1991	2		30958	30958	45500	14542	0.797	11589.974
1992	3		31916	31916	47000	15084	0.711	10724.724
1993	4		32903	32903	47250	14347	0.635	9110.345
1994	5		33921	33921	48000	14079	0.567	7982.793
1995	6		34970	34970	49000	14030	0.506	7099.18
1996	7		36052	36052	50000	13948	0.452	6304.496
1997	8		37167	37167	53000	15833	0.404	6396.532
1998	9		38317	38317	58000	19683	0.361	7105.563
1999	10		39502	39502	61000	21498	0.322	6922.356
2000	11		40724	40724	61000	20276	0.287	5819.212
2001	12		41983	41983	61900	19917	0.256	5098.752
2002	13		43281	43281	63000	19719	0.229	4515.651
2003	14		44620	44620	68900	24280	0.204	4953.12
2004	15		46000	46000	74200	28200	0.182	5132.4
2005	16		47380	47380	79500	32120	0.163	5235.56
2006	17		48801	48801	84800	35999	0.146	5255.854
2007	18		50265	50265	90100	39835	0.13	5178.55
2008	19		51772	51772	95400	43628	0.116	5060.848
2009	20		53325	53325	111300	57975	0.104	6029.4
								13991.413

NPV AT 12% D/RATE IS 13991.413 WHICH IS POSITIVE.

BENEFIT COST RATIO

Years	Time	Fixed Cost	Operating Cost	Total Cost-	Discount factor D. Rate 12%	Discounted cost	Total Revenue	Discounted Revenue	
1987	0	124000	0	124000	1	124000	0	0	
1988	1		30029	30029	0.893	26815.897	44000	39292	
1989	2		30958	30958	0.797	24673.526	45500	36263.5	
1990	3		31916	31916	0.711	22692.276	47000	33417	
1991	4		32903	32903	0.635	20893.405	47250	30003.75	
1992	5		33921	33921	0.567	19233.207	48000	27216	
1993	6		34970	34970	0.506	17694.82	49000	24794	
1994	7		36052	36052	0.452	16295.504	50000	22600	
1995	8		37167	37167	0.404	15015.468	53000	21412	
1996	9		38317	38317	0.361	13832.437	58000	20938	
1997	10		39502	39502	0.322	12719.644	61000	19642	
1998	11		40724	40724	0.287	11687.788	61000	17507	
1999	12		41983	41983	0.256	10747.648	61900	15846.4	
2000	13		43281	43281	0.229	9911.349	63000	14427	
2001	14		44620	44620	0.204	9102.48	68900	14055.6	
2002	15		46000	46000	0.182	8372	74200	13504.4	
2003	16		47380	47380	0.163	7722.94	79500	12958.5	
2004	17		48801	48801	0.146	7124.946	84800	12380.8	
2005	18		50265	50265	0.13	6534.45	90100	11713	
2006	19		51772	51772	0.116	6005.552	95400	11066.4	
2007	20		53325	53325	0.104	5545.8	111300	11575.2	
						396621.137		410612.55	

$$BCR = \frac{\sum \frac{Bt}{(1+r)^t}}{\sum \frac{Ct}{(1+r)^t}}$$

BCR = 1.03 ≥ 1.00

INTERNAL RATE OF RETURN

		Time	Discounted Factors				Net Present Value			
		Net Benefit	12%	12.5	13	14%	12%	**12.50%**	**13%**	14%
1989	0	-124000	1	1	1	1	-124000	-124000	-124000	-124000
1990	1	13971	0.893	0.889	0.885	0.877	12476.1	12420.22	12364.34	12252.57
1991	2	14542	0.797	0.79	0.783	0.769	11589.97	11488.18	11386.39	11182.8
1992	3	15084	0.711	0.702	0.693	0.675	10724.72	10588.97	10453.21	10181.7
1993	4	14347	0.635	0.624	0.613	0.592	9110.345	8952.528	8794.711	8493.424
1994	5	14079	0.567	0.555	0.542	0.519	7982.793	7813.845	7630.818	7307.001
1995	6	14030	0.506	0.493	0.48	0.455	7099.18	6916.79	6706.08	6356.805
1996	7	13948	0.452	0.438	0.425	0.399	6304.496	6109.224	6180.35	5802.258
1997	8	15833	0.404	0.389	0.376	0.35	6396.532	6159.037	5671.584	5279.4
1998	9	19683	0.361	0.346	0.332	0.307	7105.563	6810.318	4763.204	4404.529
1999	10	21498	0.322	0.308	0.294	0.269	6922.356	6621.384	4139.226	3787.251
2000	11	20276	0.287	0.274	0.26	0.236	5819.212	5555.624	3647.8	3311.08
2001	12	19917	0.256	0.244	0.23	0.207	5098.752	4859.748	3208.04	2887.236
2002	13	19719	0.229	0.217	0.204	0.182	4515.651	4279.023	3229.932	2881.606
2003	14	24280	0.204	0.193	0.181	0.16	4953.12	4686.04	3562.623	3149.28
2004	15	28200	0.182	0.172	0.16	0.14	5132.4	4850.4	3439.68	3009.72
2005	16	32120	0.163	0.153	0.142	0.123	5235.56	4914.36	2879.192	2493.948
2006	17	35999	0.146	0.136	0.126	0.108	5255.854	4895.864	2509.542	2151.036
2007	18	39835	0.13	0.121	0.111	0.095	5178.55	4820.035	2188.809	1873.305
2008	19	43628	0.116	0.108	0.098	0.083	5060.848	4711.824	2379.44	2015.24
2009	20	57975	0.104	0.096	0.086	0.073	6029.4	5565.6	2425.2	2058.6
							13991.41	**9019.011**	**-16439.8**	-23121.2

$$IRR = (lower\ \ Discount\ \ rate) + (Differenence\ \ betweem\ \ the\ \ t$$

IRR =
12.13 12.67
IRR = 12.67 ≥ 12 % therefore the project is worth accepted