SOCIOECONOMIC AND AGRICULTURE PRODUCTIVITY IMPACT OF SABAKZAI DAM: A CASE STUDY OF BALOCHISTAN, PAKISTAN

Submitted by

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CERTIFICATE

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Abstract

Water is a main component of life for all living organism. The living surface of earth is benefited direct and indirectly. It has been observed that the water crises are become serious issues for all developed as well as developing nations. United Nations are working on different countries to find the solution of water scarcity. Most of the countries have been builds small and large dams for tackle down the water crises; it is one of the most advantages in short term. It is important water-shed managements are compulsory for the reduction of long term stressed water. The study based on small dams which represented the Baluchistan province; too much backward and water stressed is a serious problems rather than other provinces of Pakistan. The study operated the dam its impact on agriculture productivity in Zhob district. Four season of weather are perfect and suitable for Quince production yields. Finding the empirical analysis used Statistical and Econometric technique. Definitely Financial and Economic analysis was calculated for doing benefits cost analysis and OLS estimation technique was also used to quantify the data for Quince production yields. Results revealed that dam had a positive impact on the livelihood of people and also enhanced living standard.

Keywords: Water Crisis, Socioeconomic and Agricultural Productivity, Cost Benefits Analysis, OLS Estimation Technique.

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CHAPTER 1

INTRODUCTION

Water has multi-dimensional usage i.e. water is used for drinking, agriculture, industrial, factories, household and other aspects of lives. Most developed countries have stored water from rainfall, glaciers melts, and flood through proper construction of dams. Most developing countries have been dependent upon the agriculture sector which faces a lot of problems in water scarcity. Agriculture is considered as the main source for poverty eradication in developing countries especially in Pakistan.

Pakistan is an agriculturist country which consumes high levels of water intensity in producing crops. Agriculture plays a vital role and constitutes the second highest part of our economy. In all country's majority of the population is involved directly and indirectly. Whereas 19.3% agriculture sector contribute in GDP of Pakistan. The enrollment of employees is 38.8% in the agriculture sector (PES, 2018-19). Approximately 60.78% of the population is spending their lives in rural areas (World Bank, 2018). Major source of water is rainfall and rivers. In Pakistan Indus River Basin is 3,180 km long which is highly contributed water from Jhelum, Sutlej and Kabul River. All four provinces are dependent upon it. Rainfall also varies time to time which has decreased the overall water. Mostly on rainy days huge amount of water is waste due to lack of dam storage. Pakistan receives just 250 mm of rainfall per year which is less than the World average (Bengali, 2009).

Balochistan is the 4^{th} province at population level, but it is geographically the largest province in Pakistan. Their total area is 347,190 km^2 and 34 districts make land size 44% of total land of Pakistan but population density is less than the rest of other provinces (GoB, 2017). Balochistan is the land of natural resources such as chromite, Gas, Marble, and Coal. Indeed the agriculture sector is the best but people are living in poor and backward conditions. Whereas 80% of people are dependent on agriculture sector (Ahmad, *et al*. 2005). Balochistan produces many varieties of fruits and crops such as apple, grapes, dates, Chico, palm, pomegranates, almond, peach, cherry and banana. Important vegetable grown are tomato, potato, and cauliflower while food crops grown are rice, wheat and sorghum. Climate is also suitable for crops growth especially for the

deciduous fruits like quince. The farmer's source of income and livelihood depends on the agriculture sector. Quince, apple grapes, onion, tomatoes, and dry fruits are exported to other provinces like Punjab, Sindh and Khyber Pakhtunkhwa. Balochistan is divided in six Agro Ecological zones based on altitude and temperature over which quince is grown in the highlands-I which is having the highest altitude and cold temperature (Saeed, 2006). Zhob, Ziarat, Killa Saifullah and Pishin districts are included. There are over 300 dams in the whole Balochistan, many of them constructed along the irrigation plains as check dams and delay action dams (GoB, 2017).The check dams recharge underground water and serve as a source of potable water for the surrounding areas.

Balcohistan being located far from Indus River, experience water scarcity more than that of Pakistan (Bengali, 2009). Main source of water is rainfall, but last two decades water table trend downward due to lack of rainfalls (Shah et al.2002). Surface and ground water level is affecting worse day by day (GoB, 2010). Infect in this situation the farmer's conscious to save trees and grow crops with such water scarcity condition is out of question.

As well as the quality of quince produced in Balochistan especially at high altitude (1600 to 2000 meters) are good quality as that produced in the rest of country. The main reason is that due to dryness of climate in quince producing area. There are no fungal diseases so in these way quince can be stored for a longer period in cold storage. In growing season sunshine also improve s the color of quince which achieves a particular price in domestic and foreign market. Water scarcity is the major constraints behind the lack of its productive capacity. Most of the residence of this districts are dependent on agriculture. The provincial government as well as the community made it possible to build several mini dams. This has facilitated some of the communities within Zhob district.

The purpose of mini dams to store water from the rivers, springs and rainfall to provide water closer to homesteads or to use for domestic and agricultural purposes. It is also used for livestock watering and recharging groundwater for extracting in nearby wells. The beneficiaries of dams are not the people living on the upper stream. Mostly in some causes middle stream living people might get of it, but that is also not compared with those living in the tail or downstream. The seepage of dam is made at end. Location of dams is selected in such a way that it could store

maximum water from rainfall through mountains. Three sides of the dam is the catchment and on the fourth side, a barrier is constructed to store that water.

The study selected the Sabakzai storage dam. It is located in district Zhob North West of Balochistan. Its catchment area is 395m (1296) feet long, height is 34.75m (114.0) feet and 7300 acres covered, preserves capacity 32700-acre feet for water storage (ADB, 2018). Spillway has discharge capacity 1630 cumec and its outlet works functioning capacity design at 1 cumec 35 cusecs. Main canal conveys 1 cumec 35 cusecs from dam and left bank canals conveys 0.5 cumec 17 cusecs. While the right bank canal was damaged by several floods in starting years (ADB, 2018). The Catchment area we mean that area where water flows towards dam mostly rainfall and rivers stream. Its start from the top of mountains from all three sides and flows towards the gravity into the dam. On the other hand command area is that part of the land which is cultivated and yields crops. In Zhob most of trees are quince which is their cash crop.

The purpose of selecting this dam for the study is that it has got the maximum catchment area, long height, high storage capacity and a smooth command area. Accordingly all these features makes it a successful dam i.e. it fulfills all the requirements that a mini dam should possess. This dam accesses higher income generation than almost all the functional mini dams in Balochistan (ADB, 2018). Mini dams provide benefits in two ways; first is the direct action which provides the water during cropping season makes it possible to yields high variety of crops. Secondly, it re-charges the ground water nearby wells and increase water table and is called Delay Action Dam (DAD) impact. This study captures the direct effects only through both quantitatively and qualitatively.

Dams are environment friendly too. It provides water for industrial, agriculture and domestic uses, also reduce poverty and improving the living standard by increasing their cropped area and cropping pattern. Similarly it improves local flora and fauna, and maintains an ecosystem which is clean green environment friendly. On the other hand it exist some negative impact as like displacement of people, land loss, loss of existing community's, resettlement of people etc. (Informal Survey). The solution of such negative impacts is to mitigate them by including the cost of environment under capital cost which is needed for building a dam which the effected people by providing them with shelter and employment opportunities (Chaudhry & Haider, 2002).

The study was conducted to see the positive impact of Sabakzai dam on the living standard of the community. The study relates these benefits through empirical analysis and will further be compared with other village which is having no mini dams. The main questions explored in the study are: What are the benefits of dam availability? Has it improved the living standard of the community? Does the dam enhance the livelihood of the people? Is Mena village (with Dam) better off rather than Rakhpor (without Dam) village having no dam?

1.1 Research Problem

The people of Sabakzai village are unaware about the irrigation system. There is low agricultural productivity due to lack of knowledge, awareness and miss-management of water in the Sabakzai storage dam area. Therefore, there is a need to highlight the importance of the dam. Since in Sabakzai village people waste much water due to the cultural system (number bare). There is also need to see the impact of agriculture productivity about dam.

1.2 Research Objectives

The endeavor of this study aims to analyze socioeconomic and agriculture impact of Sabakzai Dam.

- To analyze the impact of dam on socioeconomic and yield of Quince production.
- To estimate cost and benefit analysis of the dam.

1.3 Importance of Research

This study is of immense importance to contribute towards improving the living standard of the farming community. Study yet to see the dynamic impact of Sabakzai Dam irrigation system. To fill this gap in the agriculture environment literature of Pakistan. The study aims to analyze the agricultural productivity of quince production in district Zhob. Agriculture production and livestock are the main source of revenue. The farmer's increases productivity to get higher output. The community availed these opportunities for their living standard and environment friendly. The findings of this study provide strong insight for policy makers to efficiently promote the irrigation system and bring equitable distribution of water in line according to the needs of farmers.

Furthermore, study brings awareness and promotes the farming community toward a water efficient irrigation system.

1.4 Outlines of the Research

The study consists of six chapters. Chapter one explains a brief introduction and objectives of study. Chapter two defines literature review along with three sub-headings, exploring dam's impacts, study of cost and benefit analysis and third heading is related to quince production. Chapter three discusses area introduction of district Zhob, village profile, agriculture, irrigation etc. Chapter four consists of data description and methodology. It includes data explanation, justification of variables with formation of econometric models and its technique for estimation of financial and economic analysis of dams. Fifth chapter explored the results and discussion of the study. Chapter six is around the conclusion and policy recommendation.

1.5 Limitations of the Study

The Zhob region has a total 110 villages. (ADB, 2017). Due to lack of time and Covid-19 study conducted these two villages out of one hundred and ten. This study aims to compare the source of irrigation in two villages' dam water and tube well water. The first village (Dam) 208 observations with 444 households, while from the second village (tube well) took 94 observations according to 200 households. The study conducted a total 302 observations through stratified random sampling technique. On the other hand, socioeconomic characteristics related to study with community's livelihood source particularly land holding, cropping pattern and income generating from quince production. Impact evaluation covers only the direct impact indicators like income and increased the cropped area after dam creation estimating by financial and economic analysis. Environmental impact of dam is also positive which shows that dams are environment friendly. This impact is predicted and analyzed through informal survey and illustrated in detail the results and discussion section where mini dam impact is captured in the dummy variable.

CHAPTER 2

LITERATURE REVIEW

In this section literature review has been carried out systematically and critically related to mini dams' construction in Pakistan and in the World. In section 2.1, national and international review of mini dams constructions, impact evaluation and see the agriculture productivity. Section 2.2 describes the conceptual framework of the study of Sabakzai Dam. Section 2.3 Model specification and analysis of quince production.

2.1 Literature Review and their Impact Evaluation and Agriculture Productivity

There are different studies regarding the study of dam and its impact evaluation along with agriculture productivity

2.1.1 Studies on Dam Impact

Mansoor (2008) assessed the study the socioeconomic impact of Dhrabi Dam on agriculture productivity of three villages such as Chak khushi, Ratta Sharif and Kallar Kahar in district of Punjab Province. Primary data was collected through 124 sample sized. The study used statistical tools and descriptive analysis for finding the frequencies and cross tabulation. Objective of study was to compare the productivity of rained fed areas with the irrigated areas. Results concluded that irrigated areas are highly benefited rather than of rain fed areas. Furthermore, irrigated areas are having high socioeconomics and agriculture productivity impact due to having Dharabi mini dam. Inspite of this fact, both areas input requirements could be improved by using modern technique and advanced technology. The study was good and pointed out important conclusion about irrigated area but, he should have carried out an impact evaluation for finding out the net benefits against total cost

Chaudhry and Haider (2002) conducted the study of the importance of dams for effective water management in Pakistan. Purpose of the study was consumption of water and its dimensions, water uses present and future requirement and availability. The study showed that positive impacts are provision for agriculture, domestic and industrial uses and to alleviate poverty and hunger and improved life standards. The other hand, negative impact water logging, salinity and loss of flora

and fauna causing changes in ecosystem. The overall results showed that water consumption is higher than available water and the world will experience if the dams are not made the water scarcity more occurred in future. Study was good and as highlighted the environment aspects of dam. It was based on qualitative observations only, on the bases of which future projections were made. Empirical analysis was missing. Study also did not mention about the Environmental Impact Assessment (EPA) role regarding dam's project and criteria.

Sagin, et al. (2010) study conducted the impact of delay action dams in Balochistan. Total 117 functional dams, just thirty mini dams were selected. Data was collected through primary based. Only thirty mini dams were selected through random sampling techniques. The project used various indicators water and silt level in dam body. Economic and financial analysis used to find cost and benefits. The result showed that 21 out of thirty mini dams have positive impact on raining water surface, flow of karees/springs and wells. The study was good but the missing of conceptual frame work and small observation should need to proper extend for authentic study.

Asghar & Alam (2009) carried out a study in ICARDA project about economic analysis of irrigated agriculture by pumping and gravity flow methods in Dharabi watershed area at Chakwal district. Objective of the study was to compare different irrigation system including gravity flow, shallow water pumping and deep water pumping out of these methods is feasible and economical to carry. Statistical tools were used for calculating the benefits against in input cost. Benefits and costs further subtraction and multiplication of inputs with selling price and revenue. Results showed that gravity flow from dam irrigation system was economically more suitable as compared with other methods as it also feasible and economical to conduct. The authors should have estimated impact evaluation through continuous monitoring of the system which could make the study more authentic.

Barbieri, *et al*. (2017) explored the study the Amazon Tabajara village dam in Brazil. The data were collected through primary source 341 respondents have been taken from rural urban and Tabajara village. The study used Technique of Free Association of words. The project expressed positive impacts on socioeconomic characteristics rural and urban areas. The results showed that Tabajara village (dam) positive impact on employment, infrastructure and development sector

rural and urban areas. The study should use stratified random sampling technique. Empirical analysis was also missing. The authors should have to focus the environmental aspects of life.

The above studies highlighted the importance of mini dams over the socioeconomic and environmental aspects. The role of literature is a good contribution on study. There are critics in the building more dams that it is better to use existing water resource efficiently which will help to utilized it on other productive use which will improve the economy. On the other hand, most of the study good deal along with current study, that dams play significant role in improving living standard as well environment friendly. While the reduction of poverty, increases employment, provide water for agriculture, livestock, households and flora and fauna and improve ecosystem. Even, it does have some limitations, but that could be mitigated through proper policies and managements.

2.1.2 Studies on Impact Evaluation

Mishan and Quah, (2007) explored the concept of discount rate and benefits analysis. For the project evaluation it is important to discuss the issues of discount rate. The interest rate used in Discounted Cash Flow (DCF) to determine the present value of future cash flow is discounted cash flow. Such difficulties discovering an acceptable rate at which society can be considered to discount the future. Difficulties arise not because the society is too large difference between their income and wealth. Such differences in economics do not prevent economists from calculating the valuation of other goods and beds. Issues raised because of such reasons e.g. capital markets imperfect; progressive income tax. The study was good, but there are such difficulties, the economist must choose the appropriate discount rate which will neither understate nor overstate the returns. That is way discount rate is the most important part for calculating/ evaluating cost and benefits.

Shah, *et al*. (2002) explored the study of private and public dams in Punjab and discussed its impact on agriculture productivity. Author's aim of study was to compare the rain areas' impact with small and mini dams. The data was collected primary survey from Rawalpindi district. Both owners of the dam were interviewed to assess and compare cost and benefits. The study used Gross margin analysis. The results showed that mini dams had higher returns from fish farming and vegetables while white fodder for small dam had low return. Cost and benefit analysis also concluded that mini dams were better off rather than small dams. The study was good contribution; but there was

no empirical analysis that would have made the study more informative. On another hand no financial and economic analysis was calculated which identify the actual returns of the dam.

Cameos, *et al.* (2008) conducted the project from ADB with effectiveness of delay action and storage dams in Balochistan. This project had used different impact indicators for evaluating dams, which are indirect benefits of dam and are called DAD, as well as direct benefits. The project indicators water and silt level in the dam body, discharge from spillway during spill, seepage from dam body. The survey was conducted through primary data. The study had taken 30 dams as samples through stratified random sampling technique. Financial and economic analysis was used to find out cost and benefit analysis. The final result showed that 20 out of 30 mini dams had 20 positive impacts. Delay Action Dams (DAD) also improve the ground water level as well as open surface wells and springs/karees. However, the overall impact of these dams are high, but the study could have used more indicators which would have evaluated the impact in more depth. So the study was impressive in assessing the impact and made the stagnant policy for the government to use sustainable water and improve community.

Studies on impact evaluation provide us the information how to evaluate the projects by choosing various indicators. Recent study only selected increase in farm size and production of quince on the basis of direct impact was evaluated. Other studies evaluated mini dams using different indicators with both direct and indirect benefits. So however most of the functional mini dams have positive impact on the improving of living standard of community and provision of water for various purposes not only increase their income generating but, it reduce cost, and save time, store water which helps to recharges ground water level. Hence this was proved through benefits cost analysis which showed that benefits exceeds far from the cost returns are high discounting the future which yields community welfare.

2.1.3 Studies on Agriculture Productivity

Roosen (1999) highlighted the US apple production function within different regions. Study compared the demand and supply side of all regions. Data were conducted through secondary source 1971 to 1997. The basic objective of study was to evaluate regional impacts of technology change to how producers and consumers respond towards change in prices. The calculation

between producer and consumers surplus which shows their income worth and finding out the elasticities to check their responsiveness with price change. The study were used three stages of least square models. Results revealed that the producer of the North West region benefited more than the rest of the three regions. Because the producers are less affected due to government sanction on pesticides due to consumer region. The demand side explored that the demand for processed apple was more than fresh apples. So however, there was no relationship revealed between apple crop and its inputs in the production process. The study emphasized on the supply of apple against its demand with the change in price only. Which covers the different region production function through aggregate level and focusses on heterogeneity of apple production, due to change in price and losses made due to banning of pesticides. The study was good and based on time series data for 35 cities in US. This is the only study found for time series regarding time series data with important results.

Ahmad (2001) assessed the study of agricultural productivity growth differential in Punjab. District analysis with crops cotton, mizzens, sugarcane and rice. Primary data was collected time for the period 1990-91. Study used ordinary least square and Cob-Douglas production function. Technical efficiency raised the total factor of productivity and growth rate per annum. Sugarcane and rice were found highly consumed water. The result showed that cotton, pea and rice had inversed relationship due to land degradation, water logging and salinity. The study was good and used several important inputs which some of consumed high propensity water which occurred damages. Though it does have some limitations and that could be mitigated through proper policy from community as well as government.

Bakhsh, *et al*. (2004) highlighted the study regarding cauliflower production in Sargodha district. Primary data was collected from thirty five farmers. Objective of the study was to identify the factors that increased the production of cauliflower. The study used ordinary least square (OLS) and Cobb-Douglas production function. The results found that irrigation number, farm size, education and fertilizer have significant impact on cauliflower production. The study was good initiative for production of a vegetable but the sample size was so small to estimate the results over the whole districts. Farming experience was explanatory variable but, not justify as from which

age the experience was counted. The result was not well interpreted in detail. Return to scale was not calculated for production function.

Ahmad, *et al*. (2005) conducted the studied factors affecting carrot productivity in two districts of Punjab. Aim of the study was compare yield and profitability of carrot in districts Kasur and Sheikhpura. Primary data was conducted, samples collected from each districts. Study taken fifty farmer's interviewed through purposive sampling technique. Fifteen independent variable farming, experience, education, irrigation numbers were selected for the study to capture the output return as well as estimates of production function type model was used for estimation. The result showed that farmers have higher yield in Sheikhupura district instead of Kasur. But the Kasur output was higher than sheikhupura .The production model showed that fertilizer, seed, and sowing increased the yield significantly. The overall study was good but the sample size was still small to predict the results for the districts. However instead of purposive sampling technique should have been used stratified random sampling. Somehow insignificant variables education and farming experience interpretation was missing.

Erdal and Taskin (2010) explored the study of waste loquat utilization in Turkey. For experimental analysis purchased (1000 g) loquat from Erzurum market in Turkey. The author's aim of study was to see the impact of waste loquat on different aspect. One-way ANOVA was used. The study showed that the agriculture waste loquat was used for fermentation in amylase production. Experimental analysis revealed that waste loquat was broadly used in industrial, environmental and microbiological food. The study was good but the author have analyzed the positive effects, while there should have been discussed the both sides positive as well as negative aspect to improve the study more reliable.

Bathan and Lantican (2010) study conducted regarding production function of Banana in Philippines. Study aims to identify the factors affecting banana production. Primary data was collected from eighty growers through random sampling in four municipalities in the province. The study was conducted for nine variables which were further estimated by Cobb-Douglas production function and OLS technique. Results showed that fertilized and labor influenced the

yield significantly. So seven out of nine variables were significant except education and farming experience. The study was good contribution to literature, however return to scale was not found.

Milić, *et al*. (2010) assessed study in Europe and republic of Serbia comparing the quince production during the time period of 1999 through2008. Data was collected through a secondary source. Study used an analytical Comparative method. The quince were effected by warm temperature, harm bio chemical and market destabilization. The results showed that shortage of quince production highly affected their demand. The quince prices were high in Europe rather than Serbia. The study was good however, it was not justified with detail the shortage of quince production. The author's should have to explore the following factors.

Ahmad and Heng (2012) the researcher conducted the study of Pakistan agriculture production. The data was collected in the time series period 1965-2009. Study has four explanatory variables: Fertilizer, Human capital, agriculture card and area under crops. The study used the ARDL model. Results showed that the first three variables had a positive and significant relationship with dependent variables while crop areas were insignificantly relationship long and short run. Empirical evidence showed that the government provided less charge for fertilizes. The study was good and formal contribution, but the author's was used four explanatory variables which is very small for study. However it should have to explore and emphasized the empirical analysis with details.

Rehman, *et al.* (2013) authors conducted the study effectiveness of farmers socioeconomic and characteristics through empirical evidence from Pakistan .Data was collected 361 respondents random sample from three selected magazines. Study was used a statistical package of social science (SPSS) software. Four explanatory variables: age, education, farming experience and size of land holding. The result showed that age and land size holding were highly significant, While education and farming insignificant. Descriptive analysis results revealed that print media and fellows have played a great role in information. The study was impressive and good contribution of literature, but the explanatory variables are so small. Conceptual framework was missing, while to extend the empirical evidence that could have the study more authentic.

Rahman, Aftab, *et al.* (2017) study conducted of pears varieties proper compatibility scion and rootstock, agriculture institute of (North) Mingora Swat. Study used different varieties of quince for the production of experiment grafted rootstock. Statistical analysis (ANVOA) used in the study. The result showed that William had a higher success ratio of graft take and survival 88.94% compared to the other four Santi Maria, Hosai, Shinsui and Shaghuri. The study was good, but author's was experiment the only varieties of quince grafted rootstock while its need to experiment the best quality.

Final section of literature studies discussed the based on agricultural productivity highlighting the importance of mini dams that what impact mini dam could have on the farmer income. There are different production functions were reviewed that provided suggest towards the topic. Almost all cross sectional studies regarding present study. However, results were different due to location and other conditions which may be unsuitable for cropping. While time series study showed a different result using different methodology which showed production function estimation in separate way. Thus it is concluded that much literature is available over the production function which is the basis of income from most of the farmers along with present study. Thus mini dam plays a vital role in reducing the cost and time of growers and hence, increasing their income.

2.2 Conceptual Framework of the Study

The conceptual framework for the research study is shown below in the figure.

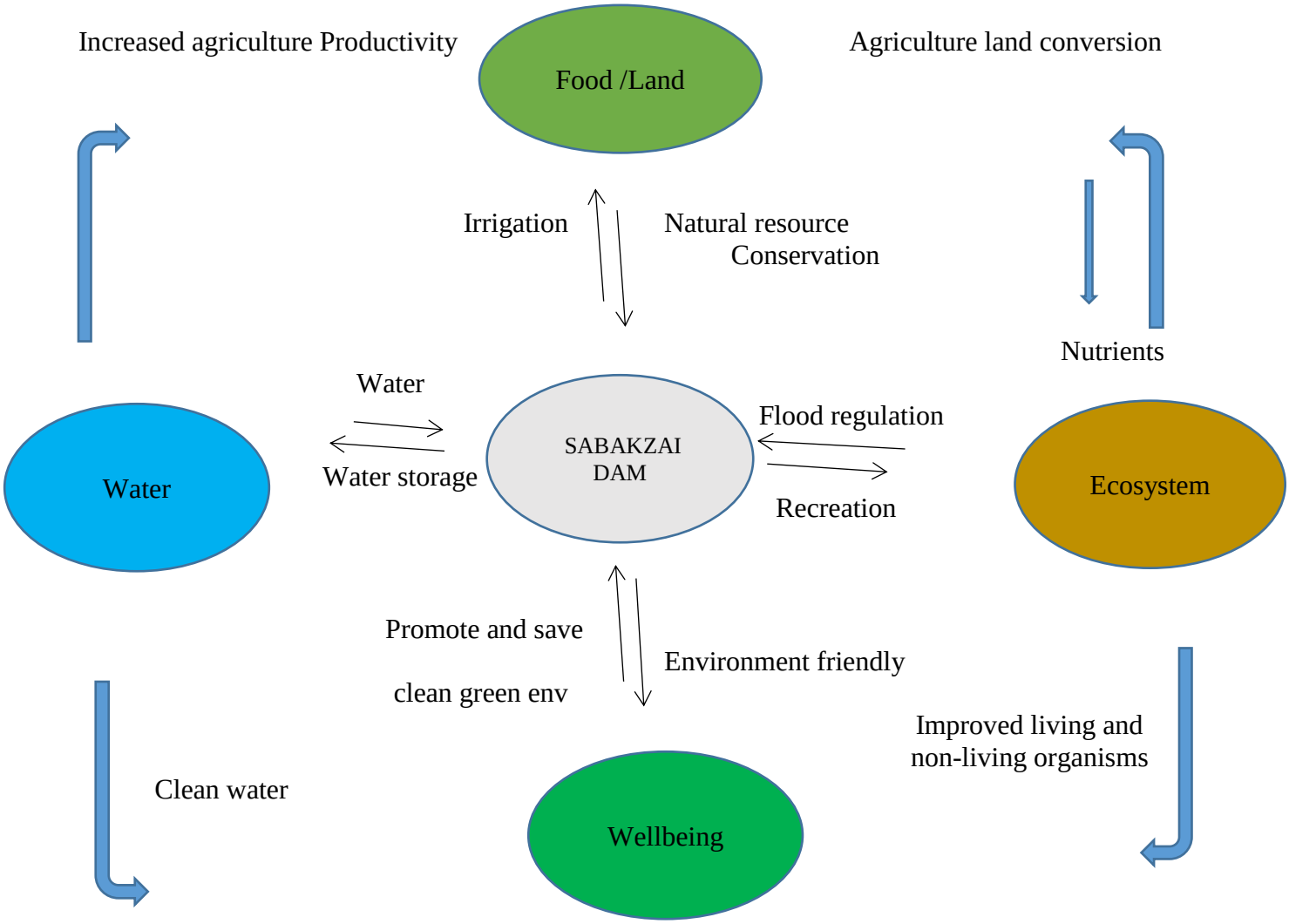
Figure 2.1 Conceptual Framework of Sabakzai Dam

Dame has the only source of water storage. It is connected interlinkage with agriculture, water, and ecosystem and community wellbeing. Sabakzai dam has central components of integration. Sabakzai dam obtaining water from the ecosystem, like karees, springs and rainfalls. Similarly, Sabakzai dam regulates flood and supports recreational environment as well as natural ecosystem for human well-being. Food and land (agriculture sector) obtaining water for irrigation and reverse it regulates natural resources conservation which is important to assist water resources management. The Sabakzai dam providing water for increased agriculture productivity. While stored water has multipurpose way purifying and clean water is used for household and livestock etc. Dam

has environmental friendly and community protect the save clean green environment. The last element ecosystem help the agriculture land conversion while it reflects the nutrition to the ecosystem. When the ecosystem sustainable it will ultimately stable the living standard of human-being.

Thus the main purpose of the dam increased the agriculture, livestock, flora and fauna. Agriculture and livestock is main source of income for the community livelihood. It is the only way to improve the society's development such as infrastructure, roads, buildings etc. The society will achieve employment like jobs, skills, labor and more technical work. When the society avails these opportunities their living standard will be high. Hence the below conceptual framework is the source of a welfare community.

Figure 2.1 Conceptual Framework of Sabakzai Dam.



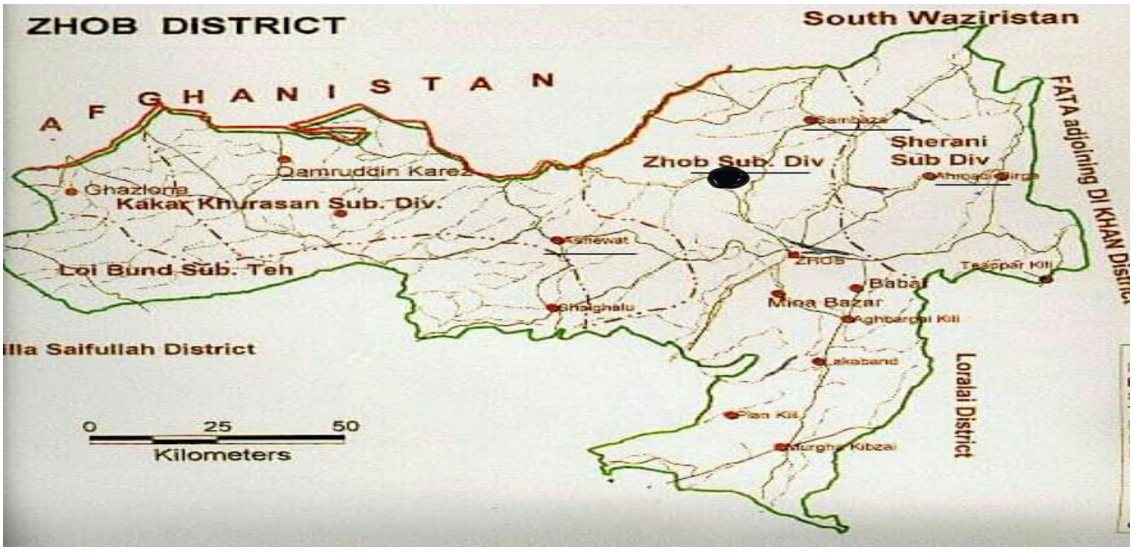
CHAPTER 3

PROFILE OF VILLAGE

3.1 INTRODUCTION OF DISTRICT ZHOB

Zhob district is the north west of Balochistan province also known as a provincially administered tribal area. Their population is estimated at 310,544 in census 2017 (GoB, 2017). Zhob is located in the north west of Balochistan. The district was originally named Appozai. In 1890 during the British era it was called Fort Sandman. With the passage of time, on 30 July 1976, the Prime Minister of Pakistan Zulfiqar Ali Bhutto changed its name and called it Zhob. The people of the city are well developed, civilized and religious. The residence is almost pashtoon i.e. about 97% are speaking Pashtoo local language (ADB, 2017). There are four main local tribes who are permanent residents of district Zhob, Babar, Kakar, Mandokhail and Lawoon while further minor tribes along with Nasar, Kharoti, Tarakai as well as Safi. There are two tehsil and twenty four union councils. (ADB, 2017) Zhob boundaries are connected with different districts like, Loralai, Killa Saifullah, Musa Khail, Sherani, Wana and Waziristan. The other side also connected with Afghanistan through the Qamar Din gateway. The people are well civilized and educated as well as cooperative with each other. In summer locals as well as foreigners from different places as tourists visit Zhob. Hunting is the hobby of local people. There is a beautiful mountain for hiking. It has spring and karees including picnic places like Selyaza, Kapeep, Babar forest, Sabakzai and Musakhwal etc. According to census 1998 male ratio 54.21% and female 43.39%, as compared to 193,458 population. But recently male-female sex ratio is 118.41 with average of population growth rate is 2.52% per year. According to 2017 census urban population estimated 46,248 (14.89%) and as well as rural population determined 264,296 (85.11%) (GoB, 2017).

a. District Map of Zhob Balochistan



***Source*:** www.google.com

3.2 Climate

The four seasons are very important for Zhob city. In the summer season from May to August the temperature is very hot. The wind is warm and temperature up to 35-38 c. It starts getting cool in September and the weather changed from November to March. In winter joyful season starts with snowfall and as well rainfall. The average rainfall is 20.60 mm with maximum range 58.8 and minimum 2.3mm. July and August in summer get the most rainfall. During the month of March to November are most likely to experience a good weather. In the month of winter the temperature often falls well below zero Celsius. Above all weather is good for cropping, especially in quince production.

3.3 Culture

The culture of this district people is similar to all pashtoon tribes in other places most relevant with Afghanistan. They wear shalwar kamez as their dress. Women wear their typical frocks having delicate work over it covered with abaya (Burqa) as they are strict doing pardah. One of the best features is that they like and prefer eating meat more than vegetable. That's the reason people are

heavy, smart, tall and muscular. House size is simple but large. Some of villages so far market side which they have kept livestock for the purpose of fulfilling milk and meat (GoB, 1997)

3.4 Energy

The people are using gas cylinders and wood for fire purposes. There is no gas connection and the people are extensively using the forest wood for fuel purposes. They used solar panels for lightening their home instead of oil lamps and kerosene lamps.

3.5 Vegetation

There is vegetation, fruits and forest trees. The major crops include wheat and fruits include quince, almond, apple, grapes, and carrot. These all crops are available in season and supplied to other provinces in Pakistan.

3.6 Agriculture / Horticulture

Agriculture is the main source of income. Therefore, the majority of peoples are involved direct and indirectly in the agriculture sector. Zhob falls in the cold zone, with a total 58,355 hectares cultivated area. In 2014-15, the reported area was consider 227,341 acre and cultivated area 58,355 acre. Whereas uncultivated area 168,986 acre and total cropped area 15,778 acre. The district is almost a single crop region. As a part or nothing is grown in Rabi season. On the hand of Kharif season, only fruits is produced. While a small area as no longer than 250 hectares under wheat, fodder which is the entire cropped area of the community was accounted for by fruits during. The fruits grown are quince, apple, pomegranate, almond, grapes etc. (GoB, 2007)

3.7 Cropping Pattern

There are different fruits production including Quince, pomegranate, apple and peach are cultivated in this region. Apple total area covered 6466 acre and produced 59190 tons. Pomegranate fruit consist of 679 acre and 4611 tons produced. Quince 420 acre 310 tons while Peach area 220 acre and 1211 tons produced (GoB, 2017).

3.8 Irrigation

There are many sources of irrigation such as tube well, karees, small dam, spring and well. Its details are provided in Table 3.1. Total area irrigated 18164 acre. The second column canal has

two parts, government as well as private. The area mentioned government source has 4000, while private considered 13000. Third and fourth column shows the number of tube wells 900, accordingly the well numbers is 144. The last and fifth column shows 120 the number of karees, spring, and others.

Table 3.1 Area Irrigated by Different Sources of Irrigation During, 2014-15

Irrigated (acre)	Canal		Tubewell	Well	Karees, Spring and Others
	Govt.	Private			
18164	4000	13000	900	144	120

Source: Asian Development Bank, (2017).

3.9 Detailed Description of the Study Areas

This section present the complete profile of two villages to fulfill the objective of the study.

3.9.1 Mena Village

Sabakzai Dam is sixty-one km away from district Zhob North West Balochistan. Mena village is the union council of district Zhob. The people are sincere with work and friendly. Most young people are working in fields. There are no government jobs and employment that way poverty is showing an upward trend. The Mena village is dependent on dam water for its irrigation. The people are educated as compared to Rakhpor village. The village household are 444 and its population size is 3436. The major produce of this area includes apple, quince, grapes, almond etc. Most of the farmers have grown apples and quinces. The best quality of quince attracts high market prices and is mainly supplied to Karachi, Lahore, Multan and Bahawalpur. The quince production is normally high because Quince is used in medicine to cure diseases like heart attack. The dam was built in 2007 with the help of the government of Balochistan. The dam water is stored the whole year for irrigation. Mena village is dependent upon dam water. The farmers' land is fertile and suitable for cropping. There are a total 60% of quince crop production. The land size fertility is higher instead of Rakhpor village due to minimum cost of irrigation. There are 80 trees planted

in each acre and 14 crates are produced from each tree the weight of per crate is 16 kg. It showed that each acre produces 1120 crates of quince in season. Still the dam is beneficial for Mena village charging less amount for irrigation therefore Mena village is better off.

3.9.2 Rakhpor Village

Rakhpor village is located 20 km away from Sabakzai Dam. In this village the people are uneducated with a small population and houses as compared to Mena bazar. This village population is 1400 people with 200 households. Education ratio is less than in Mena village, where the majority of people are farmers. In Mena village, there are large numbers of household which is why the land for cultivation are less due to high population. There is no such dam this village. The Rakhpor village hold a lot of land but have minimum cultivation due to lack of water. The farmers pay huge amount of prices for tube well irrigation. The difference between two villages the Rakhpor village has less households but the uncultivated land is greater than Mena village. They have a lot of fertile land but due to lack of water access. The main cause and problem is the cost of irrigation. They pay huge amounts of diesel and electricity. The production of quince planted 70 trees in each acre rather than 80 trees due to high cost of irrigation and no dam access. Both villages have other things that remain the same, such as climate change, inputs and outputs factors. The only difference is the cost of irrigation. In this way the Mena village is better off than Rakhpor village. People do have some livestock, but they use it for diary product needs and nor for income. They have heavily based on Quince production as their livelihood. The villager education is very low as compared to with Mena. Most of the people are farmers only few are as employed.

CHAPTER 4

METHODOLOGY

This chapter covered three sections. The first section is regarding data description with details explanation of data sources and type. Second section highlights the proper steps about sampling technique, selecting of village, sample size and population, questionnaires design and survey. Third section is based upon methodology which includes descriptive analysis, econometric analysis for Quince production as well as financial and economic analysis.

4.1 Data Description

Both primary and secondary data has been collected for the study. Secondary data taken from the irrigation department Balochistan i.e. feasibility report of Sabakzai dam. Main purpose for this was to identify about actual capital cost for the construction of this dam. This is very important as it provides the bases for estimating financial and economic analysis. Primary data was collected consisting of both probabilistic and non-probabilistic methodologies. Data was conducted successfully through farmer's personal thoughts, interviews and perception about dam benefits and other aspects of agriculture. The questionnaire was developed about socioeconomic farmer household roaster, land holding, tenure status, agriculture inputs/outputs cost etc.

4.2 Sample and Methodology

Sample and methodology are discusses in details as follows.

4.2.1 Selection of Village

The study has taken two villages. The first village is Mena which has represented the dam facility and directly benefited. The water is available whole season for irrigation. The water used for household, agriculture and livestock. The farmers have a lot of land for cultivation because they have dam opportunities. The second village is Rakhpor it is 16 km away from Sabakzai Dam. The purpose of this village selection is only for tube wells irrigation, because there is no availability of mini dams. The farmers cultivate their farm through tube wells.

4.2.2 Sample Size and Population

This study focused on two villages of District Zhob. One village is irrigated from dam water and the other is dependent on tube wells. This study used simple random sampling techniques and selected the number of respondents from each village in proportion. The first village selected for the existing dam facility total population in Mena village is 444 households and a number of 208 respondents randomly selected from this village. Similarly the second village uses tube wells because there is no mini dam. Rakhpor village consists of 200 households and a sample size of 94 respondents was selected using simple random sampling technique.

4.2.3 Questionnaire Design

A questionnaire was designed which consisted of both probabilistic and non-probabilistic data collected. It has two types of sections for quantitative and qualitative analysis to be done. So the questionnaire was divided into two parts of study. The first one is quantitative analysis and the second section consist of qualitative analysis. The quantitative analysis discusses the agriculture, land holding, farm status and tenure, inputs and outputs cost as well marketing cost. The second and last part qualitative analysis which performed the personal interview like, Participatory Rural Approach (PRA) Focus Group Discussion (FGD), Key Information Survey (KIS) and SWOT Analysis (Strength, Weakness, Opportunities and Threats) are included in the study.

4.3 Methodology

Main purpose of study is to find the significant impact of Sabakzai dam on the agricultural productivity, specifically on the production of quince in Zhob district Balochistan. The study is divided into three sections. First section of study used descriptive analysis and econometric multiple regression model OLS technique for quince production. The second section consist of financial and economic analysis. The last and final section carried out the qualitative analysis which consist of PRA, Informal survey and SWOT analysis.

4.3.1 Descriptive Analysis

After all collected the data, was entered into Statistical Analysis (STATA). Further it was divided and managed different sections. This software was used for further analysis socioeconomic and characteristics of households, land size, farmer farm, tenure status, quince cost, input cost and their income against the sale of quince units. Descriptive analysis also used for finding out the actual cost of inputs like cost irrigation and fertilizers distinguish the both villages. Further it helps in comparison of both villages as which villages is paying how much cost for inputs, as well as profit and land size. The analysis also perform the findings of irrigation number with and without using dam water, while both cost for dam water and cost for using tube well water against number of irrigation. In descriptive analysis estimate the cost of tube wells and also estimate the dam irrigation. Results explored both villages inputs cost, their profit, farm size and cultivation.

4.3.2 Importance of Quince

Quince the most important variable of study. The area of study produces different fruits like apple, almond, quince and carrot. The shape and size are similar like apple but it taste are change. The usage of quince normally medicine, it contains vitamin c and fiber, this two nutrients to cure disease like heart attack and support the immune system. Somehow eaten raw like peer or apple as well as cooked and slice. Most of the farmers have grown quince and apple, but from last two decades planted quince trees are increases due to higher demand from market side. The best quality of quince attracted its market value, while it's supplied to local, domestic and foreign market

4.3.3 Model Specification and Econometric Analysis for Quince Production

This section of the study reveals the estimation of an econometric model for quince production function. Primary data was collected from both of villages through stratified random sampling technique. Mena village (dam) 208 observation, while Rakhpor village (without dam) took 94 observation. There are total three hundred and ten observation. The data for this analysis is cross sectional regarding quince yields as an output against eight explanatory variables included as input of production and grower. So far there is no proper study has been conducted in Balochistan which identifies the explanatory variables that affect the quince yield, as discussed in chapter two. Study used multiple regression model (Baksh et al. 2004; Ahmad et al 2005; Bathan & Lantican, 2010)

for estimating quince yield using Ordinary Least Square (OLS) technique. Details regarding the model is illustrated below.

$$QY = \beta_0 + \beta 1LS + \beta 2FEX + \beta 3FED + \beta 4PA + \beta 5FER + \beta 6IRR + \beta 7PRU + \beta 8P + \beta 9Di + \in i$$

QY = quince yield (crates/ acre); (Dependent variable)

- **LS** = land size (acre)
- **FEX** = farming experience; (years)
- **FED** = farmer education (years of education)
- **PA** = age of plant/ tree (years, per acre)
- **FER** = fertilizer (kg/acre)
- **IRR** = irrigation hours (cost, per acre)
- **PRU** = pruning cost (years, per acre)
- **P** = Cost of pesticides (liter, per acre)
- **D** = dummy (1 if dam, 0 if no dam)
- **βo** = intercept
- **βI** = regression coefficients
- **E** = error term.

The Explanatory Variables are Highlighted Below:

While QY stands for Quince Yield, which is a determined dependent variable. The following are independent variables which are highlighted with their expected sign: Dummy variable included in the model to show the difference between the two villages selected in this research.

LS stands for land size. It is the cultivated area/farm where quince trees are planted. While few farmers declared that the land cultivation has not been yet. But the land size mentions only part of

the land where quince plants are cultivated. Land size is a vital variable since the greater farm size, the more production and vice versa. Many studies have shown different relationship between land size and production. Studies highlighted the positive relationship between farm size and yields (Rehman, *et al*. 2013) (*Bakhsh, et al.* 2008). The present study expected sign of land size is positive by assuming that increase in size of farm would increase quince productivity.

As far as FEX denote farmer experience, the most important variable of the study. The experience was calculated from farmers after he become 18 years old. Those farmers who have crossed their age from eighteen consider farming experience. It has been observed that the more experienced will be the more production of quince. According to previous study production function in Punjab the same variable farming experience showed significant relationship. (Ahmad, *et al*. 2005; Sheikh, *et al*. 2012). (Kiani 2008) So the present study expected sign is positive relationship.

FED refers to the education of farmers. It is calculated number of schooling years which they have passed. Education played a dynamic role in study to help farmer awareness, knowledge regarding their crops, inputs and output cost. The education will give a lot of technical knowledge and information on how to maximize their output. It also helps input cost to increase their output with best quality quince to sell in the market return high margin profit. Thus, its expected sign of farmer education is also positive. Many studies used education as an explanatory variable and to see how much relations that have on their yield (Bathan & Lantican, 2010; Ahmad *et al.*2005).

PA stands for plant age; it also executes the production of quince. It has been observed that when the age of trees is smaller their quince quantity is less because the tree length and size of leaves is not strong and healthy so it could not produce much product. When the tree has become large, their shape, size and leaves are strong, healthy and mature, so it produces more and higher quantity and quality of production. Thus the expected sign is positive. The study highlighted that there are 50% of people planted apple trees to get the high margin profit in district Ziarat (Khair, *et al*. 2002).

FER stands for the fertilizer which is the most important variable. The farmers used several of fertilizer like Urea, Potash, and NPK (nitrogen phosphorus and potassium) for their yields. It is depend from farmers according to their land farm, number of trees and their capability. Most of

the farmer chose the fertilizer in terms of their prices rather than quantity. The reasoned behind this the more they pay the price of fertilizer, the less will be the production of quince and vice versa. The expected sign of this variable is positive. That is why it is important variable in the study. The inputs provided the multi nutrition to the plant to make them healthy, strong and faster their growth within time. The previous studies also showed that the fertilizer is one of the chief variables on the yields (Bathan & Lantican, 2010; Ahmad, *et al*. 2005; Baksh, *et al.* 2004).

IRR stands for irrigation, the number of times farm is irrigated by the farmer. It is the most important variable for quince production function. It is not moly important for quince production but, it is also necessary for the trees during off season where water helped them to stay alive. It is the most expensive input variable rather than other variables. The input unites taken here with its costs. Hours of irrigation calculated by the number of times the farm is irrigated by the farmer. It will determine how much is the cost of the irrigation number of both villages and to see the impact of production. The expected sign is positive. Previous studies also finding the impacts of irrigation number over the productivity (Ahmad, *et al*. 2005; Baksh, *et al*. 2004). Despite the fact that farmers in the present study irrigate their farm 16 to 18 days in Rakhpor to avoid cost, while Mena irrigates after every 15 days it has dam water which increases the irrigation duration of the long life of soil.

PRU refers to pruning. It is the method of cutting and setting the trees for the purpose of becoming strong, healthy and perfect for growth. When it's done, the sunlight and air easily access to the crops. The new quince trees need to start pruning in three to four years through a proper expert and trained person because they would have some technique. Pruning helps the crop growth; shape and size of flower but not at all, it also increased the quality and quantity of quince with high margin profit. But the facts are that if the stems are fixed properly through various cutting tools by farmers or labors, it will also increase the production. This process is practiced before the growing season and it also leads to some cost as expert labors are hired and paid for this purpose. It is only few farmers practice it after the season to make their tree read for next growing season. The expected sign is positive. The studies have highlighted the variable as an explanatory variable with its impotence in productivity of fruits (Albert, et al. 2010).

P stands for pesticide. It is also an explanatory variable of study. The input used for the protection of yields during the season of crops. The purpose of pesticides to kill the insects and pests. It helps

them to increase the quality and quantity of crops. Very few farmers have used it because in the winter season due to low temperature insects and pests do not affect the crop mostly. Expected sign of the variable is positive.

D stands for dummy variable. This is the most important explanatory variable of the study. It is to perform the difference between villages which are the main crux of study. First village (Mena) which depends upon dam water which is available for the whole of year. The second village (Rakhpor) uses tube well water for their irrigation because there is no availability of dams. The dam village paid less cost for irrigation due to this fact increasing more and more production. The dam village planted 80 trees in each acre, while other village planted 70 trees per acre due to lack of water availability. That's is why their production is different. It shows that the dam village has produced higher quantity and quality crops and earns higher profit than other villages. Dam water has multi nutrition and impurities. It is regarded water pH value 7.8 magnesium calcium (Ca+Mg) 2.4, sodium adsorption ratio (SAR) 1.68 and relative source of contribution (RSC) 1.17 (ADB, 2017). Therefore Mena village is better off than Rakhpor village. The expected sign of the dummy variable is positive.

4.3.4 Financial and Economic Analysis

This section, used for different investment projects and capital budgeting, yields predictable outcomes against it cost. It provides the related ex-ante evidence within the framework of Discounted Cash Flow and Cost Benefit Analysis. It is not only illustrate financial feasibility and sustainability but, it also takes into account the social costs and benefits which are estimated under economic analysis (Bierman and Smidt, 1988).

The projected financial statement of a project entity will often be a good starting point for identifying economic costs and benefits. Two types of adjustments must be made to the financial calculation; so that it could reflect economic concepts. First, it may be necessary to include (exclude) some cost and benefits which have been excluded from (included) in financial analysis; and second some inputs may have to be revealed if their shadow and market prices different. (Squire and Van Der Tak, 1979).

This analysis is estimated on excel spread sheets. Data required for this analysis were the figures of capital cost, operating and maintenance cost, salvage value and cropped land size were collected from the feasibility report of the Sabakzai dam (Secondary data). On the other hand including prevailing interest rate, cost of different inputs like (fertilizer, pesticides, labor) along with the cost of new quince trees while discount rate were taken from primary source. Limited data is used for this analysis just costs were required for benefits calculated. Financial and economic analysis is calculated side by side. Four sheets have been made in excel because this analysis requires a basis like gross production value, cost of production (inputs) for new and existing quince trees, which is different for both financial and economic analysis. After that all, it is calculated to find Net Present Value (NPV), Internal Rate of Return (IRR) and Benefit Cost Ratio (B: C). Study is the present base calculated according to current market prices of inputs, interest rate etc. Because the feasibility report includes the different crops taken like quince, apple, grapes, apricot, wheat and vegetables in this way the return rate is different. They have calculated according to the prices of that time in the year 2007. Thus the study is done with quince production with current market prices. It will show the impact this dam on quince production only.

4.3.4.1 Production Cost and Discount Rate

Discount rate is the concept of time value of money. The interest rate used to discount cash flow (DCF) analysis to determine the present value of future cash flows is called the discount rate (Mishan and Quah, 2007). Discount rate takes into account the time value of money the idea that money available now is worth more than the same amount of money available in future because it could be earning interest) and the risk or uncertainty of the anticipated future cash flows (which might be less than expected). Discount rate take into account proper weighted average cost of capital (WACC) that reflects the risk of the cash flows. The discount rate reflects two things; time value of money (risk-free rate). According to the theory of time preference, investors would rather have cash immediately than having to wait and must therefore compensated by paying for the delay; and other investors demand because the other investors want it to compensate for the risk that cash flow may not materialized after all (Bierman & Smidt, 1988).

There are different projects that use different discount rates depending upon rate of interest and budget of the project with project life. Generally discount rate used 10, 12 and 15 percent it may

be increased or decreased with passage of time. Present study used a 13% discount rate. Even though the consumer presents a discount rate of 13% on commercial banks. The dam capital cost 121.44 million and their operating maintenance cost (O&M) is 5% of capital cost. Salvage value capital cost at 10%. Life of the dam is 25 years, two years was time period for their construction and 1 year is the return which is salvage value. Hence, it is total 28 years aggregate as highlighted in Chapter V (Result and Discussion).

First section is regarding budget of the project it is further divided into two parts. One column is made for the production of new quince trees while the other is determine for existing quince trees. The purpose of splitting into two parts is costs and yield of intercropped such as vegetables which is grown just during the first four years at the time of new trees planted. All cost are taken as a standard unit i.e. per acre/per crate. Farm gate has also been taken which is the cost on quince after its harvesting till the time the crates are available to the final consumer. Further it includes the cost on crates, packing, grading, transport etc. It was Rs.877 per unit at the time of survey, 2020. The same cost is further converted into per unit by dividing it through the weight of each unit (crate). The same procedure was for intercropped keeping in mind their yields for the first four years only. It was less than the cost on quince. Afterward the cost of quince sapling, seeds of vegetables along with the fertilizers, pesticides, labors per unite were added to find out the total cost per unit. So the benefits were calculated on the basis of price of each unit (crate) sold to the commission agent. It is also shown in details in result section. These are financial benefits against the financial cost. Similarly the same procedure was carried for existing quince trees. There is no cost for inter-cropped because when the trees have become large and leaves never access the sunlight to grow it fast and strong. The cost of inputs and labor are same. Benefits are also given. The details are in result section.

For economic analysis, the cost and benefits of financial analysis are multiplied by 92%, which resulted in economic costs and benefits. This 92% is called the standard conversion factors as shown in appendix.

The study used SCF which were used in different project schemes for the dams (Cameos, 2011). It has been calculated at five year based 2013 up to 2017 net imports and exports, taxes on imports and exports, subsidies on imports and exports and exports rebates. The data are calculated from

the federal bureau of statistics specified in the appendix 9. These cost and benefits of financial analysis were multiplied by 0.92 (SCF), which the economic cost and benefits are highlighted as shown in the result. The second section consists of the financial gross value of production. This is calculated by putting the cost of the new and existing quince trees with actual cropped land in the area. Net farm cost and net benefits also calculated. Same procedure is applied for economic GVP by multiplying with 0.92 standard conversion unit.

After finding out the cost and benefits along with the gross values production as well as net farm cost and its benefits. The last section entire most significant portion is the final estimation of Financial and Economic analysis. The capital costs of the dam Rs.121.44 million, for the first year of the dam construction 41.29 percent of the capital cost invested. While 58.71% were used in second year which shown in the appendix 7 and 8. Operating and maintenance (O&M) at 5 percent of capital costs. Twenty eight years is the total time period for construction along with the life of a dam. All net benefits are calculated on the basis of gross production values of net farm benefits per unit. Accordingly the same procedure is followed for economic analysis also multiplying the cost with standard conversion factor as well as the values of yields.

4.3.4.2 Internal Rate of Return

Internal rate of return (IRR) is cash flow defined as discount rate that makes the net present value (NPV) equal to zero (Bierman and Smidt, 1988). According to (Maurice and Smithson, 1985) the higher a project internal rate of return, the more reliable it is to undertake the project. Internal rate of return does not need any discount rate for calculation. While it is calculated by giving IRR command to find the whole column of net benefits on the excel table. This is the financial internal rate of return (FIRR). The same procedure followed for EIRR economic net benefits and cost.

4.3.4.3 Net Present Value

Net present value is also determined by the sum of all separate cash flows (inflows and outflow cash) of the project. It is also defined as the algebraic sum of the present values of income and present value of the expenses (Bierman and Smidt, 1988). It measures the excess or shortfall of cash flow in terms of present value once the financing charges are met (Maurice and Smithson, 1985). In this study here the cash flow is the net benefit and cost of the project. It is calculated and

summing up the total cost and benefits with multiplying 13% discount factor. Thus the single value of cost and benefits found out. After that, subtracting these benefits from cost to give financial net present value (NPV). The same calculation followed for Economic NPV, Economic Cost and Benefits.

4.3.4.4 Benefits Cost Ratio

Benefit cost ratio is the present value of benefits to the present value of cost (Bierman & Smidt, 1988). Benefit cost ratio (BCR) is a meter which attempts to summarize the overall value money of a project or investment. Benefits cost ratio (BCR) is the ratio of project benefits expressed in monetary terms relative to its cost, also expressed in monetary terms. It showed that all benefits and costs should be expressed to discounted present value. It takes into account the amount of monetary gain realized by performing a project versus the amount it cost to execute the project. The higher benefit cost ratio (B: C) is considered the best project or investment. General rule of thumb if the benefits exceed the cost, the project is acceptable. (Bierman, *et al*.1988)

The present study calculated and then divided the predictable all benefit into their costs. The cost and benefits were discounted with 13% percent and find the final financial (B: C) benefits cost ratio as well as economic (B: C) benefit cost while the discounted economic cost and benefits also projected.

4.4.1 Informal Survey

The last section of study discuss the qualitative evaluation by using Participatory Rural Appraisal. (PRA) tools). PRA is concerned about the attitude and behaviors as well as facts regarding the village. The survey collects different analysis, information and evidence from the sample community people through PRA as a measure of other ways of traditional methods. It helps to identify the issues of local people about their perception and thoughts. While it saves the time and conducts the easy method and technique. This technique reduces the gap between empirical and informal results which comprise the overall study (Chambers, 1994).

The techniques used for this study consist of Key Information Survey (KIS) and Focus Group Discussion (FGD). The objective of this analysis to depth about the issues through involving the

community people directly to know the situation through their own words. This is also helps directly predicting about the cost and benefits regarding the dam.

4.4.2 Key Information Survey (KIS)

Key information survey is one the tools for analyzing PRA. According to this technique, the selected informants are interviewed straight forward to inform about the actual facts and figures. So how it may be either in favor or against depending upon the informants experience. The responsiveness of the individual has two aspects, respect of the persons and informant orientation and methods involved according to the choice of selecting focal persons and key information.

4.4.3 Focus Group Discussion (FGD)

Focus group discussion defined by a group of individuals selected and assemble by the researchers, highlights to discuss and comment on, from personal experience, about the topic which is the subject of the research. The discussion between 6 to 12 members, involving a session that lasts up to 2 hours. The representative should be attentive to unanticipated issues that may arise as well as to ensure equal participation (Blanchard and Vanderlinden, 2009). Study further followed the same procedure and explained SWOT analysis for different strategies towards the welfare of communities.

4.4.4 SWOT Analysis

SWOT stands for, Strength, Weakness, Opportunities and Threats. This analysis key external and internal issues which allow producers of quince to carefully consider and incorporate strategic objectives. It consists of strength, weakness, opportunities and threat. Strength and weakness are the internal attributes or factors of the organization, whereas opportunities and threats are the external attributes of the environment (Erbe, 2011:42).The study has incorporated same procedure to identify SWOT analysis in both villages and detect that which village would be better off than the other.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Introduction

This chapter discusses the results of two villages' production and cost benefit analysis of Sabakzai storage dam. The study carried out using the statistical and econometric tools. The study contributes both primary and secondary information. This chapter includes further three sections; the first section is based on descriptive analysis (socioeconomic features, agriculture land holding along with irrigation cost, etc.) and econometrics model for quince production function using the OLS technique. The second section explored the result of financial and economic analysis of the dam over the cultivated area. It revealed the Internal Rate Returns (IRR), Net Present Value (NPV) and Benefits Cost Ratio (B: C). Last section deals the results are based on PRA tools like Key Information Survey (KIS) Focus Group Discussion (FGD).

5.2 Descriptive Analysis

Socioeconomic characteristics of the people and their livelihood are presented in descriptive statistics. The results includes cost and benefits of dam for both communities. The both villages are compared side by side to distinguish their feature and takes into account the both villages cost bared by for their irrigating land. The purpose of this section results is that the empirical findings will be easy to interpret as well as understand. Furthermore, it also describes some of the most important variable in the study which are used in other sections part of the study.

5.2.1 Education Head of Household

Figure 5.1 given in **appendix** the education level of both villages head. Results clearly shows that most of the people men and women are educated. But on the other hand, some of them are maximum education till masters. The Mena village education level of household head are more than Rakhpor. The reason behind that lack concern towards education as well as might be low income and living standard. Definitely Mena is having better living standard than Rakhpor. Education institutes are available in both villages at the present. But, it was few in past, that could also be

reason of less education level. Mostly household heads are little educated, till matric. Their fore-fathers have not shown much interest for their education as their main focus was their land as source of income.

Figure 5.1 presented in **appendix** the maximum number of education attained by the household head in both villages. It is one of the most important finding of the study. Here the y-axis is years of schooling while the x-axis is the number of household head. First 208 bars indicates the Mena villages while the rest 94 bars belong to Rakhpor. The blink spaces in between the bars which show that the household head is uneducated.

5.2.2 Education of family Members

Education of all family members provides an overall view of education level of both community people given in **Appendix** (Figure 5.2).

The figure shows that most of the households attained education till matric level. There are only few of them have attained maximum education of 16 years. While there is also some of members who have not attained any education at all. Two members of Mena village who have completed their studies till MPhil. Thus the overall figure shows lack of education in both villages. Blue bar in each column belongs to Mena village. Members of Mena village are relatively more educated than the other. Again the education level of Mena village is higher than of Rakhpor which shows that Rakhpor people lack their education that makes Mena better off.

5.2.3 Livelihood Sources

The study highlighted the livelihood source of both villages according to get their information.

Figure 5.3 Livelihood Sources of Household in Both Villages

Employment in Percentage								
Area	**Govt. Service%**	**Private Service%**	**Farmer %**	**Businessman %**	**Student+ children +housewives %**	**Driver %**	**Teacher %**	**If any other %**
Mena	5.66%	1.5	24.50	2.70	56.45	1.18	6.72	1.28
Rakhpor	1.33%	0.0	31.93	0.88	59.42	0.75	4.57	1.12

The above figure 5.3 shows the livelihood sources of the sample living in both villages. Student, children and housewives are considered in the same group due to the lack of information about the women. That's why, children and women along with the students access no job. Looking as majority of the people are employed as farmers. As mentioned earlier, the basis for their livelihood is their land and cropping pattern. Due to this fact, farmers children are also following them and become farmers to help their land grow more and produce high yield to earn maximum profit. Both villages have maximum number of employees as farmers. Afterward, second majority belongs to teaching profession. Both villages are involved in it. As there are some govt. schools and colleges, that is why people living in same village are hired. Those people are competent and educated, fulfilled the criteria and now performing their duties. There are just a few businessmen and drivers. Hence the overall trend shows that majority is engrossed being farmers and teacher because there is no such other opportunity for them as they have lack of education, therefor no technical skills, less exposure and mobility.

5.2.4 Land Status

Land status describes the cultivated and non-cultivated land holding between the both villages. In this way to see which village is better off instead of other? Table 5.1 shows that Rakhpor village

land availability is higher than the dam village. There is less land for cultivation in Rakhpor village due to lack of irrigation. Therefore, people cannot fertilize their land. On the other hand, Mena village has dam water for irrigation of their yields. Mostly all the land is cultivated for their crops and available water for irrigation so in this way the dam village has much land cultivated rather than Rakhpor village

Table 5.1 Land Status with in Percentage

Area	Total owned land %	Uncultivated own land %	Cultivable land without use %	Total cultivated land/ acre %
Mena village	47.50	5.00	3.98	43.52
Rakhpor village	42.60	14.80	8.40	34.20

Source: Survey data

The above table, Mena village's total owned land is higher than Rakhpor village. The first column showed that Mena total owned land. On average out of total owned area Mena has only 5% acre of land is uncultivated and 14.80% in Rakhpor as shown in the above table 5.1. It's clear that Mena farmers are having irrigation facility more than Rakhpor due to dam availability. The third column highlights the land which is able to fertile to cultivate but it is not cultivated. Similarly again Mena is having less part of land as compared to Rakhpor. The reason is that there is dam facility rather than Rakhpor. Last column of table shows total cultivated land farm, here Mena village is cultivated more land, on the other hand Rakhpor is having less. It conclude that if there was a dam in Rakhpor more land would have been under cultivation than now. In this regard, it say that the Mena is better off rather than Rakhpor village.

5.2.5 Marketing Cost and Profit

Descriptive analysis shows the process of quince marketing with their cost in different steps. It explained how much is the cost incurred on quince marketing after the time of harvesting (crates are packed) till the time it reaches the market. Details are given below Table 5.2.

Table 5.2 Marketing Cost and Profit on Average

Area	Qty sold Crate	Transport Cost Rs	Labor Wages	Marketing Cost Rs	Tax Rs	Weighting Cost Rs	Total cost	Total Revenue	Profit Rs
Mena	1	120	50	100	2	5	277	877	600
Rakhpor	1	120	50	80	2	5	257	607	350

Source: study survey.

Table 5.2 explains the total units of quantity sold in 2019. The highlighted costs are transport, labor wages, marketing cost (grading and packing) tax, and weighting cost shows on above Table 5.2. The last column shows net profit earned after excluding all the costs from total revenue. According to the result the marketing cost is not much different but the only difference is quality and quantity of quince which help to charge higher prices. It shows that Mena village is better off from Rakhpor village to gain a high margin of profit. The main objective of this comparison is to find out that Mena village, having benefited from dam water which is available during the whole year in this way, gets a lot of profit. Dam water has a lot of multi minerals, acidity, nutrients rather than tube well water, so it is very beneficial for the crop taste, leaps, and quality.

5.2.6 Hours of Irrigation and Cost per Acre.

Number of irrigation hours and cost per acre of both villages are very important for the study. For agricultural productivity, it is necessary to increase the irrigation time. According to the farmers, the four hour irrigation is required for each acre (quince). In this regard to find the both villages' irrigation numbers and cost calculated along with tube well and dam properly. In that's why determined both each unit of price irrigation.

Table 5.3 Number / Hour of Irrigation and Cost per Acre

Quince crop in Kharif season	**No of Irrigation Hours**			**Cost of Irrigation Prices**		
Area	**Dam**	**Tube well**	**Total**	**Dam**	**Tube well**	**Total**
Mena Village	12	4	16	500	9600	10100
Rakhpor	0	14	14	0	33600	33600

Source: study survey.

Both of villages are different source of irrigation and their cost. The respondent say that farm needs water every sixteen and seventeen days for irrigation. Furthermore, in the whole season each farm need sixteen time of irrigation from dam water, while tubewell water once irrigate farm approximately twelve to fourteen day. The whole season mostly requires total nineteenth time irrigation. Such cases in monsoon weather, rain fall days the farm does not need irrigation that's why exclude all rainy days from total numbers of irrigation. The results for the irrigation number and cost is calculated separately for dam and tube well water. This will provide how much is the cost incurred by irrigating through dam water and tube well per unit. The above table clearly shows about the both of villages regarding to find the direct benefits of dam.

According to the respondents each shareholder paid 500 to 1000 rupees per annum as maintenance charges for using the dam facility. These costs are used for canals and maintaining the channels of the dam facility. If the growers want, they could cultivate more land irrigated with dam water maximum in the whole season. While per unit of dam cost is five hundred. The dam village used four times tube wells in the whole season. Per acre required four hours of irrigation. Each hour of cost is six hundreds rupees. While per acre hours multiplied by six hundreds which the cost per acre carried out 2400 hundreds. Further, this multiplied by number of irrigation. The total cost is 10100 shown in above table. The second row of table shows the number of tube wells and cost. This village has no dam availability they cannot pay any cost of dam. The same per acre cost and

hours Rs.2400 which is further multiplied by number of irrigation. Whereas the total cost estimated Rs.33600. Thus excluded rainfall days the total amount of irrigation and cost is highlighted in the above Table 5.3.

At last we can conclude that the Mena village has benefited from dam water. The farmers pay minimum cost to use maximum average of water which increases of quince quality and get huge profited rather than tube well village. Regarded all these analysis we can say that the Mena village is better off due to facility of dam.

5.2.7 Descriptive Statistics of the Variables

Table 5.4a expressed the descriptive statistics of Mena village having a dam facility. Table shows mean, standard deviation, minimum and maximum values with variables. QY stand for quince yield, dependent variable minimum value 840 and maximum 1280 (crates), average value 1094.841. Land size minimum 2 and maximum value 7 acre with average of 4.10. Farmer experience minimum 2 and maximum value are 43 average 23.4 and standard deviation 08.8. Farmer education minimum 0 and maximum value are 16 with the mean value of 9.8 and standard deviation is 2.8. Age of plant minimum 7 and maximum value 25 with averages of 15.16. Fertilizer maximum value 3 and minimum value 1 average 1.99 along with standard deviation 0.6. Irrigation price minimum 500 maximum estimated is 1000 mean value is783 along with standard deviation 61.6. Pruning cost minimum value 6000 and maximum value are 39200 along with average value 15560.5. Cost of pesticides consists of 1600 minimum and maximum value shows 16000, mean value 7003.51, while standard deviation 3402.4

Table 5.4a Descriptive Statistics of Mena Village (having Dam)

Variable	Obs.	Mean	Std. Dev.	Min	Max
QY	208	1094.841	84.2	840	1280
LS	208	04.106	01.0	02	7
FEX	208	23.486	08.8	02	43
FED	208	09.808	02.8	00	16
PA	208	15.168	04.6	07	25
FER	208	01.99	0.6	01	3
IRR Price	208	783.654	61.6	500	1000
PRU Cost	208	15560.43	5038.3	6000	39200
Cost Pest	208	7003.51	3402.4	1600	16000

The bellow table 5.4b shown descriptive statistics of Rakhpor village. Yield of quince QY is a dependent variable with 94 observation, mean value 839.1, minimum value 700 and maximum 980 crates. Land size of quince yields minimum value 1 and maximum value 3 acre, standard deviation 0.4. Farmer experience minimum 1 and maximum value are 28 along with average 7.5 and standard deviation 5.2. Farmer education minimum 0 and maximum value are 14, with average value 7 and standard deviation is 4. Age of plant minimum 7 and maximum value are 25, averages value of 15.5, standard deviation 5.3. Fertilizer maximum value 3 and minimum 1 kg average value 1.97 along with standard deviation 0.785. Irrigation price minimum 550 maximum estimated prices 13200. Pruning cost minimum value 3500 and maximum value are 15525 along with average value 7848.6, standard deviation 2251.9. Pesticide cost includes 1600 minimum and maximum value is 15072 averages cost 7197.1, standard deviation 4003.1.

Table 5.4b Descriptive Statistics of Rakhpor Village (without Dam)

Variable	Obs.	Mean	Std. Dev.	Min	Max
AQY	94	839.1	85.2	700	980
LS	94	2.2	0 .4	001	3
FEX	94	7.5	5.2	001	28
FED	94	7.0	4.0	000	14
PA	94	15.5	5.3	007	25
FER	94	1.97	0.785	001	3
IRR Price	94	5844.6	4056.5	550	13200
PRU Cost	94	7848.6	2251.9	3500	15525
Cost Pest	94	7197.1	4003.1	1600	15072

According to above Table 5.4a&b there are seven out of nine variables shown different statistics between two villages. While age of plant and fertilizer are same value of both villages. Mena village quince yield (QY) maximum 1280 and minimum 840 crates, while Rakhpor village maximums 980 as well as minimum 700 crates per acre. Similarly Mena land size Maximum 7 and minimum 2, while Rakhpor have maximum 3 and minimum 1 acre. Farmer experience minimum 1 and maximum 43, while Rakhpor maximum 28 and minimum 1. Farmer education maximum 16 and minimum 0, while Rakhpor have maximum 14 and minimum 0, again Mena village is better off rather than Rakhpor village. Price of irrigation Mena village pay maximum 1000 and minimum 500, while Rakhpor village pay huge amount of cost, maximum 13200 and minimum 550. Pruning cost Mena as maximum 39200 and minimum 6000, while opposite, maximum 15525 and minimum 3500. Last and final variable cost of pesticides Mena maximum 16000 and minimum 1600, while Rakhpor maximum 15072 and minimum 1600. Thus comparison of both villages shown that Mena village is better off rather than Rakhpor village.

5.3 Econometric Analysis

The study used econometric model. This model is used for the production of quince crops of both villages according to study bases. Ordinary least square (OLS) estimation are used the results are stated below Table 5.6

5.3.1 Quince Production Function

In this study we used OLS technique to see the impact of explanatory variables with the dependent variable production function of yields. According to these analysis to see how much the output will increase or decrease against several inputs used in the production function. To check the econometric problem of multicollinearity in the model. The problem found between two explanatory variables fertilizer and pesticides. That's why pesticide was excluded. Whereas again multicollinearity was tested through correlation matrix test, there is no problem found. The purpose of excluding pesticides are less used in the area of study due to dry temperature. It is rare if quince is effected by Pest and fungal diseases as low temperate prevent it from these problems. During off season the growers put the snow on the roots and stems of tree which kills pests as pest cannot survive in low temperature.

On the other hand robustness of the model was tested for both fertilizer and pesticide, finally fertilizer was kept and pesticide was excluded not because the fertilizers was significant but it makes the overall model a good fit.

Table 5.6 OLS Results for Quince Production Function

QY	Coefficient	St. Err.	t-value	p-value	Sig
LS	62.60	7.251	8.63	0.00	***
FEX	02.32	0.481	4.83	0.00	***
FED	04.98	1.103	4.51	0.00	***
PA	-00.29	0.692	-0.42	0.67	
FER	09.75	4.877	2.00	0.04	**
IRR Price	-0.001	.0010	-1.64	0.10	
PRU Cost	-0.004	.0010	-2.73	0.07	*
DUMMY	115.75	10.478	11.05	0.00	***
Constant	668.2	16.459	40.60	0.00	***

Mean dependent var.	1015.020	SD dependent var.	145.690
R-squared	0.46	Number of obs.	302.000
F-test	202.350	Prob. > F	0.000

*** p<.01, ** p<.05, * p<.1

There are eight explanatory variables estimated as input in the production function and its impacts on the dependent variable of quince yields (QY). Diagnostic test was conducted to test the normality and problem of heteroscedasticity as in this case where data is cross-sectional. There are three hundred and two observations generated for the study. Model shows the results of both communities' production of quince. To check the heteroscedasticity robustness of the model test so there is no problem found. Value of p was 0.09 greater than 0.05 there is no problem of hetero. In this model R-squared show 0.46 it's a cross sectional data the model is good fit.

LS land size is the first explanatory variable of model. It reveals the total production area where quince trees are cultivated. The result shows that the p value is highly significant almost at 1 percent with positive sign. P-value is zero and t-statistics is also 8.63 which shows that land size is positively relationship with quantity of quince. The result reveals that if per unit land size increases the quantity of quince production increases. So respectively the numbers of trees increases and the output per tree positively increases. Basic reason behind this result is that the area of land helps growing more quince tree, similarly the more will be produced the higher return to scale. One acre has 80 tree plants i.e. if one tree produce 14 crates so 80 trees could produce 1120 crates per acre of land. If the land size is increased by two more acres the crops growths of output quantity will be increased. But, there is a limit to plant certain trees per acre. The recommended number of trees depends upon the quality of quince. If we plant more trees than recommended, than their will be overlapping and that will adversely affect the yield. Therefor it is important recommended number of trees should be planted each acre to avoid such constraints. There are some studies showed an inverse relation between farm size and productivity. Reason behind that small farmers produce more output than large does per acre due to properly managing the farm, use efficient input, lower labor cost (Ahmad & Qureshi, 1999). One more study also showed a negative relationship between output per acre and farm size. Study revealed that small farmers maximize their inputs use up to a level where marginal productivity becomes negative. They also manage to produce high output per acre without high levels of capital input use. While Middle farmers use inefficient combinations of inputs while large farmers used maximum capacity which is why there exist an inverse relationship. (Kiani, 2008)

Farmer experience is a variable which counts from the age of 18 years. This is an important variable of the model and its play positive relationship with dependent variables. In this study most of the farmers were aged 18 to 60 years old. Result shows that farmer experience highly significant at 1 percent, P value is almost zero. The highly experienced farmers know how to manage the quantity of water for yields and to also proper utilization of inputs ratio during the season of growth stage. He give the proper time to look after the farm and check their conditions if any input ratio exceeds or deficient. The previous study of Punjab, the production of cauliflower results showed positive relationship between experiences and yields (Bakhsh, et al. 2004). However another

showed that farming experience was insignificant with agriculture productivity for banana and carrot using cross sectional data (Bathan & Lantican, 2010; Ahmad et al. 2005).

Education is the most important variable which plays a vital role in this model. Those farmers who are educated their result of output is more than as compare to uneducated. Education changed the farmer's feelings; thoughts, emotions, and attitude brought a lot of awareness about cultivation, innovation and production of inputs and output production. Result shows that education is highly significant at 1 percent. Both p-value and t-stats clearly shows that education of farmer is positively correlated output of quince. The reason behind this education provides communication skills, exposure and aware that how the farms activities. Educated farmers are sincere with their farming and quickly manage the proper input/ output factors during the seasons. Those farmers who attained education, producing high yield as compared with those who did not. Educated farmers could bring about the change an alteration in the exiting farming system, implementing various combinations of inputs and also never fail to accept the change. That is the key in higher production of quince because most of the farmers during survey were quiet and rigid, not willing to provide any information but some of those who were interviewed their production level was low relative to those who were educated. The previous studies education was insignificant with productivity in Philippines and Pakistan (Bathan & Lantican, 2010; Ahmad et al. 2005). The related study showed that education is significant and positive relation with the productivity in Punjab (Baksh, *et al*. 2004).

PA age of plant is the independent variable included in the model. The putting of this variable to see if it plays a role in the production of quince. Some farmers informed that the age of plants results is producing more crates of quince due to stem enlargement, which provide more space to grow more quince than before. Result shows that age of plant is insignificant with negative sign. Reason behind this is that nowadays, the size of trees no longer matters in producing high output even though the size of tree is increased. The fact is that 70 to 80 plants grown in per acre of land. When the size of tree is increased with age, their stems of tree are intersecting one another and overlap to each other's but not only the size of a quince affected, while the sunlight does not access to crop, which is important for its growth. There is yet no study which could show the impact of tree age with its productivity, however, one study showed the reason of planting apple trees in

three northern districts of Balochistan including Ziarat. Mostly 50% farmers responded that they have planted trees to increase their output for higher return. Further, most existing trees age more than 10 years. (Khair, *et al*. 2002).

In this model fertilizer is the valuable input variable which performs the suitable relations with production of yields. Without of fertilizer crop cannot grow. Fertilizer prices are taken rather than its quantity. The price of each unit is calculated on average per unit to standardize it. If the fertilizer provided on proper time and ratio, its effect on crops quality better and higher. Result shows that the fertilizer is significant at 5 percent and p-value is 0.046 with positive sign. The reason behind this is that fertilizer provides nutrients to the crop increase the growth. Whereas the cost of fertilizer is used to find out the impact over output. Hence the low or minimum cost increases the high quality of output. The farmers used high quality neutrinos fertilizer having minimum price rather than mixing several fertilizers of high price. Thus specific ratio is required for growth production and those growers who follow it get a high level of output in this case. According to the previous study same results were showed that fertilizer was highly significant and positively affected yield as it helps the crops to grow and mature, provide nutrients that improve quality and size. (Bathan & Lantican, 2010; Ahmad, *et al*. 2005; Baksh, *et al*. 2004).

Cost of irrigation is explanatory variable in the model. The most suitable input used in study. The farmer says that the yield requires water every thirteenth or sixteenth day that is irrigated from dam or tube well water. Result revealed that cost of irrigation is significant at 5 percent with a negative sign. The reason behind inverse relation that weak canals and old drain systems have wasted much quantity of water, due to this fact the requirement of water every fourteenth and sixteenth day irrigation cycle is affected. Somehow soil fertility and salinity affected the output. In this way the prices of irrigation are higher than the quantity of output. The previous study showed the inverse relationship between irrigation number and yields due to problem of poor ground water quality, soil fertility and some other miner issue is affecting of yields. (Ahmed, *et al*. 2005). The other study showed that irrigation number is significant with yield in Punjab. When the irrigation number increases, output will increase and vice versa (Baksh *et al*. 2004).

Pruning is one of the input variables in the model. Pruning is a proper method to cut the stem and leaves to make the plant strong and healthy into better quality of fruits. It's fresh with air and

sunlight access through proper stem roots. Pruning is important at one time during three to four years. It is highly technical, just expert people will do it through proper cutting. If the pruning is done through proper technique the quince quality will be high. Result shows that pruning p values is significant at 10% with negative signs. The reason behind that pruning is not performed through a specialized or technical person. During pruning stems are cut which size of the trees made small that's why quantities of quince decreases. The pruning is not doing well proper way. Similarly, the related study highlighted that pruning and blueberry crops are positive relations, however, half of high blueberries performed unique fruits of plant in northern climate conditions (Albert, *et al*. 2010).

The last and final explanatory variable Dummy is almost important for the whole study. Dummy variable between the two villages in terms of mini dam vs without dam. The study takes two villages to find the actual impacts of the dam. It is used 1 for the dam village (Mena) while 0 for the second village without having a dam (Rakhpor). The expected result shows that the dummy is highly significant at 1 percent and p value is almost zero. The main purpose of the dam is that it has stored water from rainfall, springs and karees high level of capacity. There are many reasons behind this, mini dam provide water to the fields whole year with a negligible price. Therefore more than 2 acre of land, no tube well water is required as dam water is sufficient for whole season. The duration of irrigation is more for land which is irrigated by dam water rather than the land dependent on tube well only. Dam water has multi nutrients and a lot of minerals which is highly beneficial for quality and quantity of quince production (ADB, 2017). The importance of dam in the production of quince is not just for the increases productivity but, it also improves the size, shape, taste, color, quantity, and quality.

Thus, the overall Models showed that five out of eight explanatory variables are significant. Most of the variables expected sign is positive well as highly significant relationship. According to the result the dam plays a vital role in this in the production of quince. The people of Mena region is better off.

5.4 Financial and Economic Analysis

This is the second section of study finding the impact of Sabakzai storage dam and also analyzed financial and economic analysis. This evaluation is used by the economist for finding out the impact of the project after the projected has been implemented. In this analysis to see the impact of project as we study in literature review chapter, this analysis conceded finding the overall impact of the project. But here we are finding it for dam that's way we will find it for quince production. The impact indicators is used here over cropped and increased cropped land. This section further shows the results of such impact step by step process.

Step 1: The first step of process shows the budget of the project, the capital cost invest for construction of dam. Operating and maintenance cost, salvage value and the other different inputs like fertilizer, pesticides, labor, new trees cost shown in financial first column. The two separate tables are made the new quince trees and existing trees along with their cost. Intercropped cost also mentioned in the first table as new trees grown takes 5 years to mature as mentioned in chapter IV methodology.

Table 5.7 a& b shows the budget of both new and existing crop yields for 1st, 5th and 10th years along with their cost and benefits are calculated accordingly.

Table 5.7(a) Budget with Project for New Quince Trees

Description					**Financial Benefits In Millions Rs**				**Economics Benefits In Millions Rs**		
Yields Years	**1st**	**5th**	**10th**	**Unit. Rs**	**1st**	**5th**	**10th**	**Unit. Rs**	**1st**	**5th**	**10th**
Gross production value											
Existing Quince											
Main production kg	0	800	11760	26.8	0	21440	315168	24.99	0	19992	293882
Intercropped kg	2400	6000	0	15.5	37200	93000	0	14.6	35040	87600	0
Total Revenue Rs					37200	114440	315168		35040	107592	293882
Cost of Production											
Tractors hour	0	0	0	1100	0	0	0	1050	0	0	0
Seedling /seed kg)	1	1	0	800	800	800	0	700	700	700	0
Quince /seed No	80	0	0	200	16000	0	0	180.5	14440	0	0
Fertilizer											
NPK kg	15	25	50	50	750	1250	2500	47	705	1175	2350
Urea kg	10	20	35	45	450	900	1575	42.3	423	846	1480.5
Potash kg	5	10	20	67	335	670	1340	62.7	313.5	627	1254
FYM kg	2000	4000	5000	12	24000	48000	60000	11.5	23000	46000	57500
Agro-chemical spray	2	3	3	820	1640	2400	2400	750	1500	2250	2250

Labor Hired Days	30	45	70	500	15000	22500	35000	460	13800	20700	32200
Mics Rs**.**	-	-	-	700	600	600	700	-	550	600	650
Cost Summary Rs.	-	-	-	-	59575	77120	103515	-	55431	72898	97684.5
Total Cost Production	-	-	-	-	59575	77120	103515	-	55431.5	72898	97684.5
Cost Net Production Value	-	-	-	-	-22375	37320	211653	-	-20391	34694	196198.5

Table 5.7(b) Budget with Project for Existing Quince Trees

Description				**Financial Benefits In Millions Rs**				**Economics Benefits In Millions Rs**			
Yields Years	**1st**	**5th**	**10th**	**Unit. Rs**	**1st**	**5th**	**10th**	**Unit. Rs**	**1st**	**5th**	**10th**
Gross Production Value											
Existing Quince											
Main production kg	2000	3500	7500	26.8	53600	93800	201000	24.99	49980	87465	187425
Total Revenue RS											
Cost of Production											
Tractors hour	0	0	0	1100	0	0	0	1050	0	0	0
Seedling /seed kg)	0	0	0	800	0	0	0	700	0	700	0
Quince /seed No	80	0	0	200	16000	0	0	180.5	14,440	0	0

Fertilizer											
NPK kg	15	25	50	50	750	1250	2500	47	705	1175	2350
Urea kg	10	20	35	45	450	900	1575	42.3	423	846	1480.5
Potash kg	5	10	20	67	335	670	1340	62.7	313.5	627	1254
FYM kg	2000	4000	5000	12	24000	48000	60000	11.5	23000	46000	57500
Agro-chemical spray	2	3	3	820	1640	2400	2400	750	1500	2250	2250
Labor											
Hired Days	30	45	70	500	15000	22500	35000	460	13800	20700	32200
Mics Rs	-	-	-	700	600	600	700	-	550	600	650
Cost Summary Rs	-	-	-	-	42775	76320	103515	-	40291.5	72898	97684.5
Total Cost Production	-	-	-	-	44975	76320	103515	-	40991.5	72898	97684.5
Cost Net Production Value	-	-	-	-	10825	17480	97485	-	8989	14558	89740.5

Source: Study Result

The above Table 5.7a&b calculate the budget of both new and existing quince trees. The main difference between them is that intercropped also cultivated between quince trees. For the first four years after the tree become planted and its cost and benefits are calculated in table 5.7a, while 5.7b is non intercropped cost as there sunlight does not access between the mature trees due to this fact vegetables cannot grown. Basically we have taken four cost which includes, gross production of producing new and existing quince, cost of production, fertilizer and labor. Each unite of variable is mentioned. Cost are calculated and written in the column first after which expected benefits have been calculated for **1st**, **5th** and **10th** years. This is for financial cost and benefits calculated. Respectively Economic cost and benefits are calculated by the same procedure by multiplying with 0.92% which is the standard conversion factor for economic analysis (Cameos, 2011). Gross prices includes the farm cost which is the cost per unit packing, grading and transportation at the time of harvesting till the time of crates are reached to the final market. This steps the way road to for Financial and Economic analysis.

Step 2: In this step of the analysis shows the financial and economic gross production value (GVP), both the new and existing quince trees are shown in the table, including land size with their crops. By the help of this financial gross value production (GVP) calculated along with economic (GVP), details given in appendix 1-6 step by step.

Step 3: Step three the last and final analysis of Internal Rate of Return (IRR), Net Present Value (NPV) and Benefit Cost Ratio, which are calculated by the help of financial and economic analysis of dam (Appendix 7 and 8). Financial and economic cash flow (cost and benefits) generated from step 2 appendix. Internal Rate of Return (IRR) calculated where no discount rate was used. But NPV and B: C involves the discounted cost and benefits. This step is the final crux of this analysis.

Appendix1. Financial GVP, Farm Cost and NPV shows in millions, with the project of new and existing quince trees. The first column shows the new and existing quince acreage of dam area. The second column determines GVP (per acre) 0.31 and 0.2 multiplied by acreage 112 and 264 to distinguish the result of GVP 34.72 and 52.8 million rupees. While column fourth Farm Costs 11.59 calculated from above Table 5.7a total cost multiplied by acreage. The last column NPV 23.13 and 25.48 which is calculated GVP subtract to Farm Cost. Thus, total net production value calculated 48.61 million rupees against the total area of 376 acre.

Appendix 2. Highlighted with more details step by step net financial benefits and net farm cost taken against the area. Whenever the dam area increases 50 to 75 and 112 acre consistently the financial benefits also increase 1.8 to 8.58 and 34.72 along with financial farm cost 2.97 to 5.78 and 11.59 million. The same procedure is given step by step the last finding of total financial benefits 87.52 and net farm cost 38.91 million rupees against the total 376 acre.

Appendix 3. Financial cash flow with a ten years' time period calculated among financial benefits, net farm cost and net production value. First year cash flow benefits 8.07 and net farm cost are 8.2 taken from Appendix 2**.** After subtracting the net financial benefits to net farm cost the NPV has shown -0.13 million rupees. In the same procedure, the last ten years are mentioned step by step.

Appendix 4. Shows economic GVP, Farm Cost and NPV of new and existing quince trees with the same procedure as we calculated before in Appendix 1. The first column highlighted dam area acreage. Second and third column shows GVP per acre and GVP. The fourth and fifth column shows Farm Cost and NPV. Whereas column first acreage 112 multiplied by with second column GVP per acre, thus column third GVP generated as 32.48. Farm cost column fourth is calculated from Table 5.7a total cost multiplied by acreage carried out 10.94. The last column NPV simply subtract the column third from column fourth the NPV found 22.25. The same procedure applied for existing quince step by step. The last row of column total new and existing crops acreage 376 with the results of GVP 80, Farm cost 36.72 and Net production value are calculated 43.99 million rupees are shown in Appendix.

Appendix 5. Economic benefits and farm cost given in Appendix Table. Whenever the area of new and existing quince increases the economic benefits and farm cost similarly increases. The land size increases step by step 50, 75 and 112 acre the benefits are increases definitely 1.75 to 8.06 and 32.91. While farm costs also increases from 2.77 to 5.46 and 10.94 million. The same process for the second row of existing quince area increases from 117 to 175 and 264 acre, so economic benefits increase from 5.8 to 15.3 and 47.52. Similarly farm cost also rises from 4.71 to 12.75 and 25.78. The total acreage is 376 economic benefits are calculated 80 million rupees as well as farm cost 36.72 million rupees, shown in Appendix.

Appendix 6. After calculating the above results of economic benefits and farm cost now it is easy to carried out economic cash flow over a ten years' time period. The first column of benefits 7.55 subtract from net farm cost 7.48 thus the NPV is carried out 0.07 of the initial year. The second year's benefits 23.36 subtract from net farm cost 18.35 thus the NPV carried out 5.01 million rupees. The same eight years NPV are calculated. The following procedures are step by step given in the Appendix**.**

Appendix 1 to Appendix 6 shows the results of financial and economic GVP, Farm cost and Cash flow with project of dam condition. With the same procedure find out GVP, in Appendix 1 carried out the Net farm cost and NPV. Appendix 2 showed net financial benefits and net farm cost taken against the area. After calculating these all process step by step finally carried out the financial cash flows which are shown in appendix 3. Including all financial and economic analysis are calculated

with financial and economic cost with their benefits. The same procedure for Economic GVP, Farm Cost and NPV shows economic cash flow ten years' time period net benefits, net farm cost and NPV as shown in Appendix 4-6.

The final step is the crux of this analysis and to see the project life expectancy for how many years this project is beneficial for the community. Data was conducted from the secondary source irrigation department. The feasibility report consists of dam construction, operating maintenance and salvage value. Financial and economic cash flow already estimated ten years of time period in previous step 2 which is very important to find the project life.

Appendix 7 and **8** shown specify the results of financial and economic analysis in details. Capital cost is Rs.121.44 million along with operating maintenance cost. . Twenty eight years is the total life of this project consisting of 10 percent capital cost salvage value. The first part of the dam invested at 41.29% percent capital cost in the initial year. And 58.71% percent are used in the second year while at 5% capital costs are estimated operating and maintenance (O&M). First two years are considered as the dam construction cost. The following costs, benefits and net benefit are calculated on excel spreadsheet and are given on the same table.

After these all study now the last and final results of financial and economic analysis are shown in Table 5.8 Internal Rate of Return (IRR) Net Present Value (NPV) and Benefits Cost Ratio (B: C) are estimated from the assistance of financial and economic analysis appendix 7 and 8. Net present value and benefits cost ratio are finding with discount cost, benefits and internal rate of return (IRR) calculated without discount rate, study help from Cameos, *et al.* (2008) and the same method and technique follow from them.

Table 5.8 financial analysis carried out from previous **Appendix** 7 and 8. It is calculated here by summing up the total costs and benefits than multiply by 13% discount rate. Thus the single value of cost and benefits highlighted. After that subtracting benefits from cost the financial value find out 109.41 million rupees. The same technique of procedure are applied for Economic NPV cost and benefits. Second row internal rate of return (IRR) does not need any discount rate for calculating. It is just giving the command IRR to excel table the whole column of net benefit, financial internal rate of return FIRR find out 24%. The same process and technique for Economic net benefits and cost. The last and final results of benefits cost ratio. It is calculated simply dividing the projected total benefits from total costs. Financial B: C ratio find out 4.23, the same procedure are calculated for discounted economic costs and benefits.

Table 5.8 IRR, NPV and Benefit Cost Ratio B: C Sabakzai Dam at 13% Discount Rate

Details	**Financial Analysis**	**Economic Analysis**
Net present Value at 13% Discount Rate	109.41	105.84
Internal Rate of Return (IRR)	24%	25%
Benefit cost Ratio at 13% Discount Rate	4.23	4.55

a) Net Present Value (NPV)

According to rule of thumb if the NPV exceeds to zero project should be reliable and accepted. The financial NPV is 109.4. Which shown that the NPV is very high and far greater than zero. The discount rate is 13 percent. On the other hand the same result economic NPV is 105.84 which is also higher than zero. It shows that the impact as well as opportunity is very high. These criteria of study help from (Cameos, et al. 2008).

b) Internal Rate of Return (IRR)

For project acceptance there should be internal rate of return (IRR) greater than discount rate, in this regards IRR value is higher than discounted rate, thus the project is feasible and accepted. The above Table 5.8 shows the financial internal rate of return feasible 24% which is greater than discount rate 13%. On the other hand shows the Economic Internal Rate of Return (EIRR) is 25% which is also higher than 13% discount rate. The result shows that impact of dam is very high as its rate of return is far greater than discount rate. The same technique and evolution was followed by the study of mini dam Balochistan (Cameos, *et al*. 2008).

c) Benefits Cost Ratio B/C

Final and last finding of the result cost and benefit ratio of dam impact. According to rule of thumb if the ratio is a positive number the project should be accepted. Calculating and summing all discounted cost and benefit after that dividing the benefits from cost yields the B: C ratio. The financial benefits cost ratio 4.23 which is higher than zero. Thus the economic benefits cost B: C ratio 4.55 also greater than zero. After these all positive results we can say that the project is reliable the dam is showing positive result along with agriculture productivity and source of income. The previous studies highlighted the mini dam's positive impact and higher benefits instead of cost. (Shah, *et al.* 2002; Cameos, *et al*.2008).

Thus the cost and benefits analysis clearly shows that dam play important role in agriculture sector. The impact of yields benefits higher than cost.

Finally the overall results of this section shows the presence of Sabakzai dam is positive sign due to higher impact. The benefits are more than total cost. Internal Rate of Return (IRR) and Net Present Value (NPV) obviously shows that the dam has significant impact on agricultural as well as livelihood of Mena village. Both financial and economic analysis clears with evidence that the Sabakzai Dam is highly beneficial for community people.

5.5 SWOT Analysis

According to last section, finding four determinants to analyze such as strength, weakness, opportunities and threats for Mena village as well Rakhpor village. Through these analyses, we learn about the issues, problems and to find the solution for their betterment. Strength shows the power of a community on their production and wellbeing with respect to other communities. Weakness highlights the problems on yields and growth. While opportunities also express the communities' advantages on their resources. The last element threatens the dangerous movements and factors that people should be aware to protect and safe from any deterioration.

Figure 5.4 SWOT ANALYSIS FOR MENA VILLAGE (Existing dam)

Strengths	**Weakness**
➢ Dam water is beneficial for agricultural productivity, because water has a lot of minerals and nutrition's. ➢ Increase the quality and quantity of crops. ➢ It increases the duration of irrigation, reduce cost ➢ It increases the capacity of ground water. ➢ It is used for many purposes of life, agriculture, household, livestock and other aspects of life. ➢ It perform the growth of local flora and fauna ➢ It fetches high price in market.	➢ Dam water is always mismanaged from local people. ➢ Lack of awareness ➢ Weak and small drainage (seepage) water does not flow to the farm for proper irrigation. ➢ Farmers have to sell quince at earliest avoid damages/ cost ➢ Lack of public participation ➢ Lack of transparency an responsibility
Opportunities	**Threats**
➢ Dam is environment friendly clean green as well as ecosystem and other benefits of society. ➢ It provides the water whole year and high capacity storage increase the productivity. ➢ The farmer could increase the area for cultivation. ➢ The grower has opportunity to increase their source of income(more cultivation) ➢ It reduces the poverty and optimized the opportunity of employment.	➢ Water logging and salinity along with siltation could reduce dam life and water quality. ➢ Heavy rainfalls due to climate change could spoil crop productivity. ➢ Earthquake and flood occur which could des troy infrastructure, agriculture and human lives of the community.

Figure 5.5 SWOT ANALYSIS FOR RAKHPOR (without dam)

Strengths	**Weakness**
➢ Farmers are always active and selfish for their productivity. ➢ Growers still cultivate crops and earn profit despite without dam productivity. ➢ Land is suitable for fertile especially for cropping quince yield. ➢ The farmers are hard worker as they use existing resources efficiency to maximize output.	➢ There is no water storage due to having no dam. ➢ Illiteracy and lack of experience affect their agriculture productivity. ➢ Farmers earn less profit due to paying high cost of irrigation. ➢ Lack of infrastructure such as road, transports and market. ➢ Load shedding and technical problem of tube well have decreased their production. ➢ Less cultivated land due to high cost of irrigation.
Opportunities	**Threats**
➢ There should be organized programs to boost up awareness. ➢ Technical skills formal education must for their source of income and productivity. ➢ There could be made a mini dam to store water. ➢ Infrastructure could be improved which would bring prosperity.	➢ Climatic change heavy rainfall could spoil productivity and reduce income. ➢ Floods and earthquake occurred location of community is a danger zone. ➢ Shortage of water quantity affects the quality of crops. ➢ Lack of irrigation facilities and high cost on tube wells could reduce existing land farm.

5.6 Informal Survey Results

This is last and final section of questionnaires and final results of the chapter. Informal survey denoted PRA participatory rural approach method a person meet and discuss or interview face to face each other such as key information (KIS) focus group discussion (FGD) and SWOT analysis.

5.7 Key Survey of Information

This is a survey through case study of both villages conducting two respondents as informants, one from each village. They were educated and aware about the details of village such as farming, irrigation, environment and the other related information.

5.7.1 Government Employer in School

Mr. Ashmir Khan is the resident of Mena village and he served a lot of time as farmer on his land farming. He was the first key informer about the survey with a lot of knowledge, experience related to dam impact and resources of benefits and opportunities. According to respondents, once the farmers irrigate their farm then they no longer have a time period around seventeenth days. The main advantage of the dam facility is that farmers will increase land fertility to generate a source of income. The growers use the best quality of fertilizer and pesticides on their fields due to paying a negligible price for water. Lifestyle and living standard are much better than in the last few years. After the construction of the dam the land value is increasing day by day. The behavior of people and thoughts changed due to source of income. The farmers try to cultivate more lands with minimum cost of water. Dam has a lot of opportunities for the community people. Furthermore, he said that the groundwater has risen at top level instead of that village there is no access to the dam. Spring, karees and open well water is clean and fresh for utilization of reservoirs. He observed that irrigation of dam water has changed the quantity and quality of the quince like shape, size, and taste and also increases the demand of market cost. Dam water is available for whole year irrigation of yields.

5.7.2 Market Dealer and Supplier

Mr. Mera Khan is a second key informants of survey, who belongs to Rakhpor village and much experience in market dealing and knowing the factors of production and qualities. He spent one of his half-life farmer his own land. When asked his views, thoughts and feelings for having no dam.

"I feel that our production land, environment, seasonal effect and water quantity are all the same like Mena village. The Rakhpor farmers are very strong and active with their works but the only difference is the dam which they are deprived of. In this case they pay a high cost for irrigation. The farmers use normal quality pesticides and fertilize due the fact that they cannot afford the high quality prices. We have much land for cultivation but due to lack of dam opportunity. Sometimes load shedding or shortage of diesel mostly in crop season farmers faced a lot of difficulties. So that's why the farmer cost of irrigation is very high due to this fact irrigation reduce our profit margin.

5.8 Focus Group and Discussion

Focus group discussion means to get information through informal surveys from farmers of both communities individually. In this way group was mad involving household from top of the bottom area of both villages in order to cover the participation from all areas to ensure the benefits of dam. On the other hand, the other village participants were also interviewed to find out their difficulties for non-existence of dam. All these issues are already explained in section first Table 5.4 and 5.5 within the frame of SWOT analysis.

5.9 Livestock

According to study analysis dam has not only proved the agricultural productivity but it is also played important role in livestock like animals, cow, sheep's, and donkey. Livestock is also the source of income for community well-being. The people of Mena village have opportunities such as fodder, shrubs, flora and fauna for livestock. Livestock of Mena village is not just for household level but they have availed this advantage for source of income. So the Rakhpor village has minimum livestock for household's dairy farm due to lack of water facilities. The community used tube wells water for household and agriculture. The livestock need water and fodder which is not available in high quantity. Thus, the people of Rakhpor village have minimum livestock instead of Mena village.

CHAPTER 6

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Conclusion

The study was based on impact assessment of dam on socioeconomic and agricultural productivity. The study consisted two villages which use two types of irrigation: the first village irrigated their farm through dam water and the second village used tubewell water. According to study analysis, Sabakzai dam plays a vital role in agricultural productivity. While the land size and cropped area increases in fact the source of income and living standard of the community improved. The community availed a lot of opportunities land size, irrigation and other input of production. The existing dam has covered the past destroyed crops which were highly affected from droughts, salinity and floods. Afterwards the construction of the dam the farmers cultivated their land more to increase its total revenue and got high benefits from the dam. Dam water has minimum cost of irrigation. The water is highly affective for crops quality, quantity, shape size and tastes. The reason behind that it has multi nutrition and minerals than ground water, regarded water contributes pH value 7.8 magnesium calcium (Ca+Mg) 2.4, sodium adsorption ratio (SAR) 1.68 and relative source of contribution (RSC) 1.17 (ADB, 2017). The people of Mena village are educated compared to Rakhpor village. Both villages are dependent on the agriculture sector, especially for quince yields. The communities have opportunities to fertile land and suitable weather that provides an ideal conditions for quince growth. Quince produced in Zhob district which are exported in local, domestic as well as foreign markets. In fact the commission agents also play a vital role in generating their income from both sides along with wholesalers and retailers for a society welfare.

Actually there is no difference between both villages because they were located in soft areas. The conditions like weather, climate and rainfalls are the same for quince growth. The only difference between their income (Profit) as the cost on irrigation as highlighted in results. Thus dam water reduce the cost of farmers living in Mena village while Rakhpor farmers pay a huge cost due to this fact their profit reduced. The Rakhpor farmers have cultivated 70 trees in each acre of their land due to lack of irrigation facility. While Mena cultivated 80 trees per acre which shows the sales of Mena farmers are more than Rakhpor and thus he revenue as well. The only reason behind this dam facility is that the Mena village is better off than other villages.

It has been observed that direct benefits of this dam as shown empirically in recent study: qualitative analysis also further explored that indirect benefits of the dam are also up to the mark which was conducted through informal survey. The presence of dam also helps in discharge the ground water

especially like karees, springs and open surface wells. On the other hand it helps in preventing the reduction of ground water table in that region, Respectively Baluchistan is experiencing in a decreasing trend of ground water table. While the beneficiaries increased living far away from dam area who required their water needs through open surface wells and springs. The far living communities also fed their animals through open surface wells recharged by dams which contribute on their income as they are dependent upon livestock.

The origin of study analysis consists of three sections. The first section is based on socioeconomic and agriculture productivity. Descriptive analysis Mena village has educated and livelihood source better than Rakhpor. Subsequently the cost of irrigation in which the dam water is minimum cost, while the other villages pay huge amount of irrigation cost due to tube wells. Mena village generates high margin revenue than Rakhpor village. The econometric model which shows that the overall model was good and positive relations. The dummy variable performed positive and highly significant which showed that dam has a positive impact and plays a vital role for the living of Mena village. The second section consists of financial and economic analysis. This section was based on Mena village only, to find out the impact of mini dam on the community people. The results showed that impact was high as IRR, NPV and B/C ratio, all these analysis prove that this project is success as benefits exceeds the cost. Last section deals with qualitative analysis. Through this analysis the informants highlight their thoughts about the cons and pro of mini dam. According to their thoughts the impact of Sabakzai dam on both the socioeconomic and agriculture productivity is high along with its indirect benefits which helps in recharging ground water and hence contributes in wellbeing for the people of whole region.

Regarding these analyses, we can say that Sabakzai Dam has a positive impact on the whole region, socioeconomic, living standard, production sector as well as ecosystem. The main focus of the study for taking two villages was shown that the existence of Sabakzai dam has multiple benefits to Mena village rather than Rakhpor village.

6.2 Policy Recommendations

- Land resource should be used at optimal level to achieve large productivity and prosperity and hence, high returns.
- There should provide education and other institute for promoting the agriculture sector.
- Enhanced the farmer experience to save look after the large scale of productivity.
- Growers should also be guided to improve the quality of fertilizer and their best combination with the ratio so that, they may produce quince crops efficiently with less resources including cost.
- Government should provide the subsidies to farmers specially inputs costs like pesticides, agro chemical spray, fertilizer etc.
- Pruning is a serious issue it is important to guide the farmers through proper training and skills which the farm need expert and technical person.
- Government and community should cooperate each other to repair the old canal and drainage system. While most of the time water wasted.
- The size of the dam and their capacity of reservoir should be sufficient to ensure sustainable production based on water balance studies and accommodate the silt load over a project life of more than 28 years. Otherwise the silt load would be enough to fill the reservoir within the period of 6 to 8 years.
- Pricing off irrigation water to keep the project running on sustainable ground.
- Operational and maintenances cost need to regulate through sharing of cost as well as management with the participation for the welfare of water uses.

  These above policy recommendations are very important and should be practiced and adopted for both rural and urban areas which avoid any constraints so that sustainable and efficient use of water management would be practiced. Indeed this water is preserved from rainfall, springs or karees which is the main source of water in Balochistan. Water is the source of both requirement farmers as well as other aspects of lives such as living standard community improvement and clean green environment.

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APPENDIX

Figure 5.1 Education Level Head of Household Both Villages

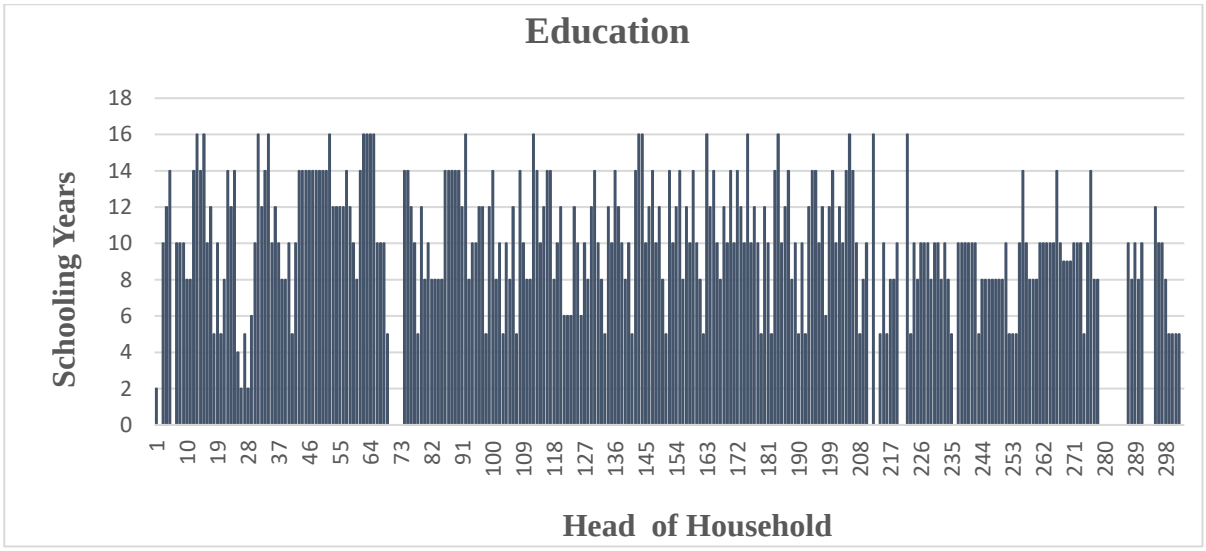
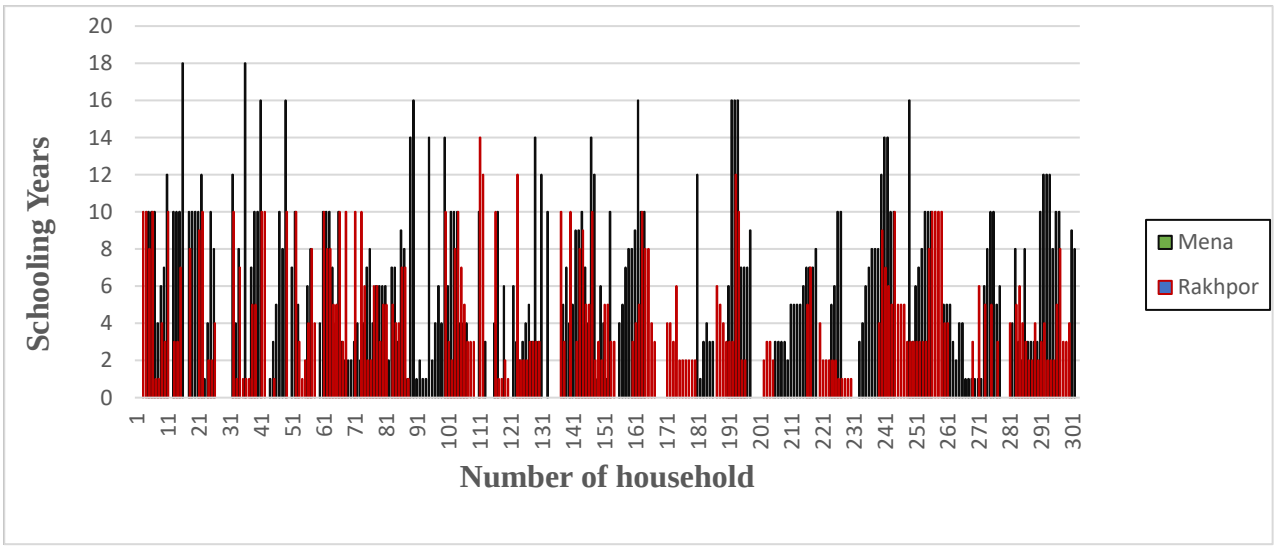


Figure 5.2 Education of Family Members Both Villages



Appendix 1: Financial GVP, Farm Cost, and NPV with Project

		Financial prices in Million. Rs			
Crops	**Acreage**	**GVP Per Acre**	**GVP**	**Farm Cost (Acre)**	**NPV**
New Quince	112	0.31	34.72	11.59	23.13
Existing Quince	264	0.2	52.8	27.32	25.48
Total	376	0.51	87.52	38.91	48.6

Appendix 2: Net Financial Benefits and Net Farm Cost due to Increase Dam Area

Increased in Area with Dam (acre)	**Increased in Benefits Million. Rs**	**Increased in Farm Cost Million. Rs**
50 75 112	1.8 8.58 34.72	2.97 5.78 11.59
117 175 264	6.27 16.41 52.8	5.23 13.35 27.32
167 250 376	8.07 24.99 87.52	8.2 19.13 38.91

Appendix 3: Financial Cash Flow in Million Rupees

Without Project				With Project		
Year's	**Benefits**	**Net farm Cost**	**Net Value Production**	**Benefits**	**Net Farm Cost**	**Net Value Production**
1	0	0	0	8.07	8.2	-0.13
2	0	0	0	24.99	19.13	5.86
3	0	0	0	87.52	38.91	48.61
4	0	0	0	87.52	38.91	48.61
5	0	0	0	87.52	38.91	48.61
6	0	0	0	87.52	38.91	48.61
7	0	0	0	87.52	38.91	48.61
8	0	0	0	87.52	38.91	48.61
9	0	0	0	87.52	38.91	48.61
10	0	0	0	87.52	38.91	48.61

Appendix 4: Economic GVP, Farm Cost and NPV with Project

Economic Benefits in Mill. Rs

	Acreage	**GVP Per Acre**	**GVP**	**Farm Cost (Acre)**	**NPV**
New Quince	112	0.29	32.48	10.94	22.25
Existing Quince	264	0.18	47.52	25.78	21.74
Total	376	0.47	80	36.72	43.99

Appendix 5: Net Economic Benefits and Net Farm Cost Due to increased Dame Area.

Crops	Increase area with Dam(acre)	Increase in Benefits Mill. Rs	Increase in Farm Cost Mill. Rs
New Quince	50 75 112	1.75 8.06 32.48	2.77 5.46 11
Existing Quince	117 175 264	5.8 15.3 47.52	4.71 12.75 26
Total	167 250 376	7.55 23.36 80	7.48 18.35 36.72

Appendix 6: Economic Cash Flow in Million Rupees

	Without Project			**With Project**		
Years	**Benefits**	**Net Farm Cost**	**Net Value Production**	**Benefits**	**Net Farm Cost**	**Net Value of Production**
1	0	0	0	7.55	7.48	0.07
2	0	0	0	23.36	18.35	5.01
3	0	0	0	80	36.72	43.28
4	0	0	0	80	36.72	43.28
5	0	0	0	80	36.72	43.28
6	0	0	0	80	36.72	43.28
7	0	0	0	80	36.72	43.28
8	0	0	0	80	36.72	43.28
9	0	0	0	80	36.72	43.28
10	0	0	0	80	36.72	43.28

After these all process financial and economic analysis specifies their results in details below Appendix 7 and Appendix 8. Capital cost Rs. 121.44 million, while total life of project 28 years and first two years for dam construction. Project cost, expected benefits and net benefits are calculated on excel spread sheet (Appendix 7 and Appendix 8).

Appendix 7: Financial Analysis of Sabakzai Storage Dam

a) Construction Cost: Rs. 121.44 Million

b) Operating and Maintenance Rs. 2.6 Million

	Project Cost				**Project Benefits**		
Years	**Project Cost**	**O&M**	**Existing. Agri. Benefits**	**Total**	**Agri. Benefits (Quince)**	**Total**	**Net Benefits M.Rs**
1	50.34	50.34	0	50.34	0	0	-50.34
2	71.3	71.3	0	71.3	0	0	-71.3
3		2.6	0	2.6	-0.13	-0.13	-2.47
4		2.6	0	2.6	5.86	5.9	3.2
5		2.6	0	2.6	48.61	48.6	46
6		2.6	0	2.6	48.61	48.6	46
7		2.6	0	2.6	48.61	48.6	46
8		2.6	0	2.6	48.61	48.6	46
9		2.6	0	2.6	48.61	48.6	46
10		2.6	0	2.6	48.61	48.6	46
11		2.6	0	2.6	48.61	48.6	46
12		2.6	0	2.6	48.61	48.6	46
13		2.6	0	2.6	48.61	48.6	46
14		2.6	0	2.6	48.61	48.6	46
15		2.6	0	2.6	48.61	48.6	46
16		2.6	0	2.6	48.61	48.6	46
17		2.6	0	2.6	48.61	48.6	46
18		2.6	0	2.6	48.61	48.6	46
19		2.6	0	2.6	48.61	48.6	46
20		2.6	0	2.6	48.61	48.6	46
21		2.6	0	2.6	48.61	48.6	46
22		2.6	0	2.6	48.61	48.6	46
23		2.6	0	2.6	48.61	48.6	46
24		2.6	0	2.6	48.61	48.6	46
25		2.6	0	2.6	48.61	48.6	46
26		2.6	0	2.6	48.61	48.6	46
27		2.6	0	2.6	48.61	48.6	46
28	4.4	2.6	0	7	48.61	48.6	41.6

Appendix 8: Economic Analysis of Sabakzai Storage Dam.

Economic Analysis of Sabakzai Storage Dam.

Project Cost					Project Benefits		
Year	**Project Cost**	**O&M**	**Existing. Agri. Benefits**	**Total**	**Agriculture Benefits(Quince)**	**Total**	**Net Benefits M.Rs**
1	49.32	49.32	0	49.32	0	0	-49.32
2	56.2	56.2	0	56.2	0	0	-56.2
3		2.4	0	2.4	0.07	0.07	-2.33
4		2.4	0	2.4	5.01	5.1	2.7
5		2.4	0	2.4	43.28	43.3	40.9
6		2.4	0	2.4	43.28	43.3	40.9
7		2.4	0	2.4	43.28	43.3	40.9
8		2.4	0	2.4	43.28	43.3	40.9
9		2.4	0	2.4	43.28	43.3	40.9
10		2.4	0	2.4	43.28	43.3	40.9
11		2.4	0	2.4	43.28	43.3	40.9
12		2.4	0	2.4	43.28	43.3	40.9
13		2.4	0	2.4	43.28	43.3	40.9
14		2.4	0	2.4	43.28	43.3	40.9
15		2.4	0	2.4	43.28	43.3	40.9
16		2.4	0	2.4	43.28	43.3	40.9
17		2.4	0	2.4	43.28	43.3	40.9
18		2.4	0	2.4	43.28	43.3	40.9
19		2.4	0	2.4	43.28	43.3	40.9
20		2.4	0	2.4	43.28	43.3	40.9
21		2.4	0	2.4	43.28	43.3	40.9
22		2.4	0	2.4	43.28	43.3	40.9
23		2.4	0	2.4	43.28	43.3	40.9
24		2.4	0	2.4	43.28	43.3	40.9
25		2.4	0	2.4	43.28	43.3	40.9
26		2.4	0	2.4	43.28	43.3	40.9
27		2.4	0	2.4	43.28	43.3	40.9
28	4.1	2.4	0	6.5	43.28	43.3	36.8

Appendix 9. **Standard Conversion Factor for Economic Analysis for Various Schemes in Million Rupees**

Unit/Year	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
1 Total Imports (CIF) (I)	533,791.5	627,000.0	634,630.3	714,371.9	530,144.6
2 total Exports (FOB) (E)	443678.3	539070.1	560,946.7	652,293.8	214,351.79
3 Taxes on Imports (Ist)	77346.5	78,091.0	70,923.9	82,494.0	100,332.8
4 Sales tax on Imports (Ist)	32,027.5	37,620.0	63,463.0	71,437.2	148,173.7
5 Subsidies on imports	31,724.0	34,040.0	32,775.0	61,791.0	73,687.0
6 Taxes on Exports (E tax)	11.9	1320.1	1385.0	814.8	530
7 Exports Rebates (E reb)	24,460.0	25,110.9	23,667.6	12,209.3	20,422.6
SCF	0.91	0.92	0.90	0.93	0.92

Notes: Data has taken from Federal Bureau of Statistics, (*Monthly Statistical Bulletin*).

QUESTIONNAIRE

INTRODUCTION

Part I

(a) Household Roaster

General Information

1 Name of HH ……..	**Age……...**	**Education ……..**	**HH cast /biradrai ……..**
Distance from paved road ……Kms	**From highway/main road ……..Kms**	**Distance from nearest market ……Kms**	**Name of city……**

(b) Socioeconomic Household Information.

	1	2	3	4	5	
ID	**Name(s) of the family member(s)list household members**	**Relationship to the Head of Household**	**Marital status** **1=never married** **2=currently married** **3=widow/widowed** **4=divorced** **5=separated**	**Education (years of schooling passed)**	**Employment**	Code for Q2 1=head,2=spouse,3=son/daughter 4=son/daughter in law,5=father/mother 6=brother/sister,7=grandson/daughter ,8=niece/nephew, 9=other relative 10= servant, 11=non relative,12= any other
CODE	Name	Code	Code	Years	Code	
						Code for Q5 1=laborer,2=Armedservice,3=Govt.service,4=private service,5=foreign service, 6=pensioner,7=farmer,8=businessman, 9=driver, 10=unemployed, 11= teacher , 12= any other

Part 2 QUANTITATIVE ANALYSIS

a Agriculture land holding and its characteristics

Land ownership and tenure status

1.Total owned area by household ……Acre **2. Rented in (contract)…….Acre** **Rate/Acre……Rupees** **3. Shared in……Acre …….% share**	**4. Rented out (contract)……Acre** **Rate/Acre…….(Rupees)** **5. shared out ……..Acre……%share** **6. uncultivated own land…….Acre**	**7.cultureable land** **But not used for cultivation……...** **8. Total cultivated (farm) area….. Acre(1+2+3-4-5-6)** **9. Number of fragmentation …….**

b) Cultivated Area, Soil Texture, Land Farm, Drainage, Tenure Status and Agriculture Tax.

Cultivated Area (Acre)	Soil Texture*	Land Farm **	Drainage+	Tenure Status++	Agri. Tax Rs/Acre	Dam water used or Tube wells

*Soil texture (Heavy=1, Medium=2, Light=3), **Land from (slop with terraces =1, slope without terraces=2, Plain on the river bank =3) + Drainage status (well drained=1, Medium drained =2, poor drainage=3) ++ Tenure status (1=owned ,2= tenant ,3=owner –cum- tenant +++ Agri. Tax type (1= Agric. Tax on produce ,2= land ,3=Crop area ,4 = water /irrigation , 5=any other)

c) Quince Orchard Area, Yield / Acre and Production, Previous 2019-20

Name of Crops	% of Total Area (Acre)	Age of Plant	No. of Trees/Acre	Production /Acre			
				2020 Qty/Acre	Price/ Unite	2019 Qty/Acre	Price /Unit

d) Land use Pattern (2020) Details of Land Abandoned

Name of Crops	% of Total Cultivated Area	Water Logging	Salinity	Other

e) Costs / Inputs about Species (Varieties) per Acre

Inputs	**Unit**	**Quantity**	**Price per Unit**
Nursing plant price/ Transportation cost			
Digging hole and plantation			
Farm yard Manure cost Bags per unit			
Soil preparation /transportation			

Inputs	**Unit**	**Quantity**	**Price per Unit**
Irrigation No .& Cost			
Fertilizers; • Urea • Sequestering • NPK • Potash			
Pesticides: • Emamactin • Nitrophos • Larsebeen • Omite			
Harvesting			
Pruning			

(f) Marketing Cost

- Sale……..Unit……
- How far is the Market (Km)……..
- Where and whom did you sale ……..
- Problems of Marketing i)…….ii)……..iii)……..

Others ……

a Suggestion for solving marketing problems……

b Timing and cost of market

Quantity Sold Crates	Prices Received (profit earned) Rs
Transportation Cost Rs.	Market Cost Rs
Labor Cost (Wages)Rs.	Weighting kg
Tax Rs	Others(Specify)

(g) Livestock

Do you have any livestock? …… (1=yes, 2= No), If yes than proceed

Income from Livestock 2020

Source	**Rs**
How many Cattle's	
Number of Cows	
Number of Sheep's	

Number of Donkeys	
If Others	

Part III QUALITATIVE ANALYSIS (Informal Survey)

PRA Tools

1) Key Information Survey (Case studies)
2) Focus Group Discussion
3) (SWOT) Analysis