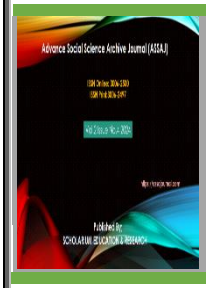

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SOCIOECONOMIC AND AGRICULTURE PRODUCTIVITY IMPACT OF SABAKZAI DAM: A CASE STUDY OF BALOCHISTAN, PAKISTAN

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ABSTRACT

This study was carried out to compare the yield of Quince fruit in two villages of District Zhob such as Mena village where Dam is used as source of irrigation and Rakhpor village which relies upon tube well as source of irrigation. For this purpose, primary data was collected on various inputs from the respondents along with the sources of irrigation such as Dam and Tube well used for the quince production in village Mena and Rakhpor. For econometric analysis, multiple OLS regression technique was applied and Descriptive statistics on socioeconomic characteristics was estimated. Findings revealed that the overall model was good and shown positive impact of education of Household head, Household family education and Land size, and negative impact of Fertilizer price and cost of irrigation hours on Quince yield. The dummy variable also have shown positive and highly significant impact on Quince yield which reveals that dam has a positive impact and plays a vital role in improving the living standard of Mena village. In a nutshell, it can be said that Sabakzai Dam has a positive impact on the on the socio economic features and productivity of Quince. The study recommended that Land resource should be used at optimal level to achieve large productivity and prosperity and hence, high returns. Secondly, Government and community should cooperate each other to repair the old canal and drainage system to minimize the wastage of water. Lastly, the Pricing of irrigation water to keep the project running on sustainable ground.

Keywords: Yield of Quince, Socio economic, Multiple OLS regression technique

INTRODUCTION

Water has multi-dimensional usage i.e. water is used for drinking, agriculture, industrial, household and other aspects of lives. Most developed countries have stored water from rainfall, glaciers melts, and flood through proper construction of dams. On

the other hand, developing countries relies upon agriculture and faces acute water shortage. Agriculture is considered as the main source for poverty eradication in developing countries especially in Pakistan. Agriculture is the lynchpin of Pakistan's economy and consumes more than 90 percent of water to produce crops. Agriculture sector contribute more than 20% 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 contributes in supply to Jhelum, Sutlej and Kabul River. All four provinces are dependent upon it. In the rainy season, large amount of water goes waste due to lack of dams storage. Pakistan receives just 250 mm of rainfall per year which is less than the World average (Bengali, 2009). Baluchistan is the 4^{th} most populous province, but it is geographically the largest province in Pakistan. The total area is 347,190 km^2 and its 34 districts make land size about 44% of total land of Pakistan but population density is less than other provinces (GoB, 2017). Baluchistan is the land of natural resources such as chromite, Gas, Marble, and Coal. Similarly, 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 and quince fruit is grown in the highlands-I which is having the highest altitude and cold temperature (Saeed, 2006). This includes district Zhob, Ziarat, Killa Saifullah and Pishin. There are over 300 dams Balochistan and many of them are 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. Balochistan being located far from Indus River, experience water scarcity more than that of other provinces of Pakistan (Bengali, 2009). Main source of water is rainfall, but during the last two decades water table has declined due to lack of rainfalls (Shah et al.2002). Surface and ground water level is adversely affecting day by day (GoB, 2010). Despite water scarcity, the farmers are conscious to save trees and grow crops.

So far the quality of quince is concerned, the produce at high altitude (1600 to 2000 meters) are of robust standard in the country. The main reason is that due to dryness of climate in quince producing area, there are no fungal diseases, so quince can be stored for a longer period in cold storage. In growing season sunshine also improve the color of quince which generates a good price in domestic and foreign market. Water scarcity is the major constraints behind the dwindling productivity in District Zhob. 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 main purpose of mini dams is to store water from the rivers, springs and rainfall to ensure water availability for domestic and agriculture use. The 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 the initial 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. Quince is the most potential crop of District Zhob. 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 recharges 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 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. Also, the Sabakzai village people waste much water due to the cultural system (number bare). There is also need to see the impact of dam on agriculture productivity.

For this purpose, the present study is planned to analyze the socioeconomic impact of Sabakzai Dam and its impact on yield of Quince production. The Zhob region has a total 110 villages. (ADB, 2017). But, due to time constraints only two villages are selected for the study.

Literature review

This section includes the socioeconomic impact of dam and its impact on agriculture productivity.

Socio Economic Impact of Dam

Mansoor (2008) checked 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 and compared the productivity of rained fed areas with the irrigated areas. Findings revealed that irrigated area have received high benefits compared to rain fed areas and was economically developed with bumper productivity. Similarly, Chaudhry and Haider (2002) conducted the study to check the importance of dams for effective water management in Pakistan. Results revealed that water use was in excess to the available water, and it was predicted that water scarcity will be high if dams were not constructed. Likely, Sagin et al. (2010) conducted a study and checked the impact of delay in dam's construction in Baluchistan. Findings confirmed through cost and benefit analysis that 21 out of thirty dams have positive impact on flow of springs and wells in Baluchistan. Asghar & Alam (2009) conducted economic analysis of different irrigation system Under ICARD project in Dharabi watershed area at Chakwal district. Results showed that gravity flow from dam irrigation system was economically more suitable as compared to shallow water pumping and deep water pumping. Shah, et al. (2002) explored the study of private and public dams in Punjab and discussed its impact on agriculture productivity using Gross margin analysis. The results corroborated that mini dams have generated good return from fish farming and vegetable, whereas small amount of return was generated in case of small dams used for fodder crops and same impact was revealed through cost and benefit analysis.

Impact of Dam on Agriculture Productivity

Ahmad (2001) assessed the growth in cotton, maize, sugarcane and rice and its nexus with water in Punjab by applying ordinary least square and Cob-Douglas production function. Findings revealed that technical efficiency raised the total factor productivity and growth rate per annum. Also, Sugarcane and rice were found highly water consuming crops. Likely, Bakhsh, et al. (2004) carried out the study regarding cauliflower production in Sargodha district using ordinary least square (OLS) and Cobb-Douglas production function. The results found that numbers of irrigation, farm size, education and fertilizer have significant impact on cauliflower production. Akin to these, Ahmad, et al. (2005) conducted a study to check the carrot productivity in two districts of Punjab i-e Kasur and Sheikhupura by analyzing impact of farming experience, education and numbers of irrigation on it. The result showed that farmers have higher yield in Sheikhupura district instead of Kasur, but the overall productivity was higher in Kasur than Sheikhupura.

Data and Methodology

4.1 Data Description

Primary data has been collected for the study using probabilistic and non-probabilistic methodologies. Data was collected successfully through farmer's personal thoughts, interviews and perception about dam benefits and other aspects of agriculture. The questionnaire was developed on socioeconomic factors, farmer household roaster, land holding, tenure status, agriculture inputs/outputs cost etc.

4.2 Sample and Methodology

Sample and methodology are discussed in details as follows.

4.2.1 Selection of Village

The study has taken two villages. The first village is Mena which has a good catchment area and has directly benefited from the Dam. The dam water is 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. In Mena Village where Dam is constructed, 208 respondents were randomly selected from 444 households. Similarly, 94 respondents were selected from 200 households in Rakhpor village where the main source of Irrigation was tubewells.

4.2.3 Questionnaire Design

A questionnaire was designed which includes both probabilistic and non-probabilistic data. The quantitative data on agriculture, land holding, farm status and tenure, inputs and outputs cost as well marketing cost was collected.

4.3 Methodology

Main purpose of study was to find the significant impact of Sabakzai dam on the agricultural productivity, specifically on the production of quince in Zhob, Balochistan. Descriptive statistics was estimated and econometric multiple regression model OLS technique was used.

4.3.2 Importance of Quince

This is the potential crop of District Zhob. The shape and size are similar like apple but its taste are change. Quince is mostly used in medicine, because it contains vitamin C and fiber and can cure diseases like heart attack and support the immune system. Most of the farmers have grown quince and apple, but from last two decades quince trees orchards are increased in number due to high market demand.

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 two observation. The data for this analysis is cross sectional regarding quince yields as an output against eight explanatory variables included as input of production. So far, 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.

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

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.

RESULT AND DISCUSSION

5.1 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 the communities. The comparison of both villages to distinguish their features and takes into account the cost incurred by each village for irrigating their land. Furthermore, it also describes some of the most important variables which is used in other sections part of the study.

5.1.1 Education of Household Head

Figure 5.1 given in **appendix** shows the education level of both villages' household heads. Results indicates that most of the people including men and women are educated. But on the other hand, some of them have 16 years of education. The Mena village education level of household head are more than Rakhpor. The reason is low income and living standard of Rakhpor Village.

5.1.2 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 who 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.

5.1.3 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 respondents 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 have no access to job. Also, majority of the people are employed as farmers. As mentioned earlier, the basis for their livelihood farming both villages have maximum number of employees as farmers. The second highest number of population belongs to 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 fulfilled the criteria and now performing their duties. There are just a few businessmen and drivers. Hence the overall trend shows that major population is involved in farming and teaching because there is no such other opportunity for them.

5.1.4 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 is dependent on dam water for the purpose of irrigation. Due to sufficient water availability cultivated land in Mena Village is more compared to 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 shows the total land owned by Mena village which is higher than Rakhpor village. On average, total owned area of Mena Village is 47.50% and 5% acre of land remained uncultivated. On the other hand, total owned land in Rakhpor village is 42.60% and 14.80% remained uncultivated. It's clear that Mena farmers have high irrigation facility compared to Rakhpor village due to dam availability. The third column highlights the land which fertile to cultivate not cultivated. Similarly again Mena is having less part of land as compared to Rakhpor. Last column of table shows total cultivated land, which shows that here Mena village has more cultivated land, on the other hand Rakhpor has less cultivated land. So, it can be said that more land would be brought under cultivation if dam was constructed in Rakhpor.

5.1.5 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. This includes transport cost, labor wages, marketing cost (grading and packing), and weighing cost. 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 exist in quality and quantity of quince which results in charging higher prices. This shows that Mena village is better off than Rakhpor village and have high margin of profit. The main objective of this comparison is to find out that Mena village have benefited from dam water which is available throughout the year. Dam water has a lot of multi minerals and nutrients rather than tube well water, which enhanced the nutritional profile of crop.

5.1.6 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 are calculated along both for tube well and dams.

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 villages are different in cost of irrigation. The respondent say that farm needs water after every sixteen and seventeen days of 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. The rainy days are excluded because farms does not require 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 the direct benefits of irrigation through 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 across the season. While per unit of dam cost is five hundred. The dam village used four times tube wells in the whole season and four hours of irrigation are required per acre. Each hour cost is six hundreds rupees. While per acre hours if multiplied with six hundreds 2400 rupees cost per acre. Further, this is multiplied by number of irrigation so, the total cost is 10100 as shown in above table. The second row of table shows the number of tube wells and cost. This village has no dam availability so, they cannot pay any cost of dam. The per acre cost Rs.2400 is further multiplied by number of irrigation and the total cost estimated Rs.33600 is paid per acre. Thus excluded rainfall days and 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 amount of water which promote quince quality and get huge profit rather than tube well village.

5.1.7 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 and is dependent variable with minimum value 840 and maximum 1280 (crates), and its average value is 1094.84. The minimum land size recorded as 2 acre and maximum value was 7 acre with average land of 4.10 acre. Farmers have minimum experience of 2 years and maximum experience was 43 years with the average years of experience recorded at 23.4 years and standard deviation was 08.8. Farmer education recorded at the minimum 0 and maximum value are 16 years along with the mean value of 9.8 and standard deviation recorded at 2.8. Minimum age of plant was 7 and maximum value was 25 with averages of 15.16. Fertilizer maximum value was 3 and minimum value was 1 with the average value of 1.99 and standard deviation of 0.6. Irrigation price recorded at minimum value of 500 and maximum estimated value is 1000 and mean value is 783 along with standard deviation 61.6. The minimum Pruning cost value was 6000 and maximum value was 39200 along with average value 15560.5. The minimum cost of pesticides was 1600 and maximum was 16000, while the mean value was 7003.51, while standard deviation was 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 of 700 and maximum value of 980 crates. Land size of quince yields has minimum value of 1 and maximum value of 3 acre, while standard deviation was 0.4. Farmer experience has minimum value of 1 and maximum value are 28 along with average 7.5 and standard deviation of 5.2. Farmer education was recorded at minimum 0 and maximum value 14, with average value of 7 and standard deviation of 4. Age of plant at minimum was 7 and maximum value are 25, with its averages value of 15.5 and standard deviation value of 5.3. Fertilizer maximum value was 3 and minimum value of 1 kg with average value of 1.97 along with standard deviation of 0.785. The minimum irrigation price was 550 and maximum estimated price was 13200. The minimum pruning cost has value of 3500 and maximum value of 15525 along with average value 7848.6, and standard deviation value estimated at 2251.9. Pesticide cost has 1600 minimum value

and maximum value was 15072 with its averages cost of Rs. 7197.1, and standard deviation of 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 that have shown different statistics between two villages. While age of plant and fertilizer are same for both villages. Mena village quince yield (QY) was estimated at maximum 1280 and minimum 840 crates, while Rakhpor village has maximums 980 value as well as minimum 700 crates per acre. Similarly, Mena land size has maximum value of 7 acres and minimum value of 2 acres, while Rakhpor have maximum 3 and minimum 1 acre. Farmer experience is recorded at minimum 1 and maximum 43 years, while Rakhpor has maximum 28 and minimum 1 year of experience recorded for the respondents. Farmers has maximum 16 and minimum 0 years of education, while Rakhpor have maximum 14 and minimum 0 years of education. So, again Mena village is better off than Rakhpor village. Price of irrigation in Mena village at maximum was 1000 and a minimum of 500, while Rakhpor village pay huge amount of cost, at maximum 13200 and minimum 550. The Pruning cost of Mena was a maximum amount of Rs. 39200 and minimum 6000, while in Rakhpor the maximum value was 15525 and minimum value of 3500. The cost of pesticides in Mena was maximum 16000 rupees recorded and minimum value of 1600, while Rakhpor has maximum 15072 rupees and minimum was 1600 rupees. Thus comparison of both villages shown that Mena village is better off than Rakhpor village.

5.2 Econometric Analysis

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

5.2.1 Quince Production Function

In this study we used OLS technique to see the impact of explanatory on the dependent variable production function of yields. According to the analysis, the output will increase or decrease against several inputs used in the production function. Multicollinearity problem was found between two explanatory variables such as

fertilizer and pesticides. That's why pesticide was excluded. Whereas, again Multicollinearity was tested through correlation matrix test, and it was not found. The purpose of excluding pesticides is its minimum use 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 as 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 impact was checked on the dependent variable of quince yields (QY). Diagnostic test was conducted to test the normality and problem of heteroscedasticity because the data was cross sectional. There are three hundred and two observations generated for the study. Model shows the results of both communities' production of quince. No Heteroscadasticity was found in the model because value of p was 0.09 and is greater than 0.05. The value of R-square was 0.46 which shows that the model was fit.
LS, the 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 has positive 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 will be 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 under the age of 18 to 60 years old. Result shows that farmers experience was highly significant at 1 percent, and P value was 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 gives the proper time to look after the farm and check their conditions if any input ratio exceeds or decrease. The previous study of Punjab for the production of cauliflower 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 as compared 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 with the output of quince. The reason behind this is that education provides communication skills, exposure and awareness in farmers. 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 in 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 is the age of plant which is the independent variable included in the model. The putting of this variable is to check the role in the production of quince. Some farmers are 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 on the productivity, however, one study shows 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 after 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.

6. Conclusion and Policy Recommendations

The study was based on impact assessment of dam on socioeconomic and agricultural productivity. The study consist of 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. After the construction of 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 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.

The origin of study analysis consists of three sections. The first section is based on socioeconomic and agriculture productivity. Descriptive analysis show that Mena village has educated people and livelihood source are better than Rakhpor. Subsequently, the cost of irrigation is minimum in Dam village, while the other villages pay huge amount of irrigation cost due to tube wells. Mena village generates high marginal revenue than Rakhpor village. The econometric model which shows that the overall model was good and shows positive impact of independent variables on Quince yield. The dummy variable shown positive and highly significant impact which showed that dam has a positive impact and plays a vital role in improving the living standard of Mena village. In a nutshell, it can be said that Sabakzai Dam has a positive impact on the whole region, its socioeconomic features, living standard, and production 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. The study recommended that Land resource should be used at optimal level to achieve large productivity and prosperity and hence, high returns. Secondly, Government and community should cooperate each other to repair

the old canal and drainage system to minimize the wastage of water. Lastly, the Pricing of irrigation water to keep the project running on sustainable ground.

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APPENDIX

Figure 5.1 Education Level Head of Household Both Villages

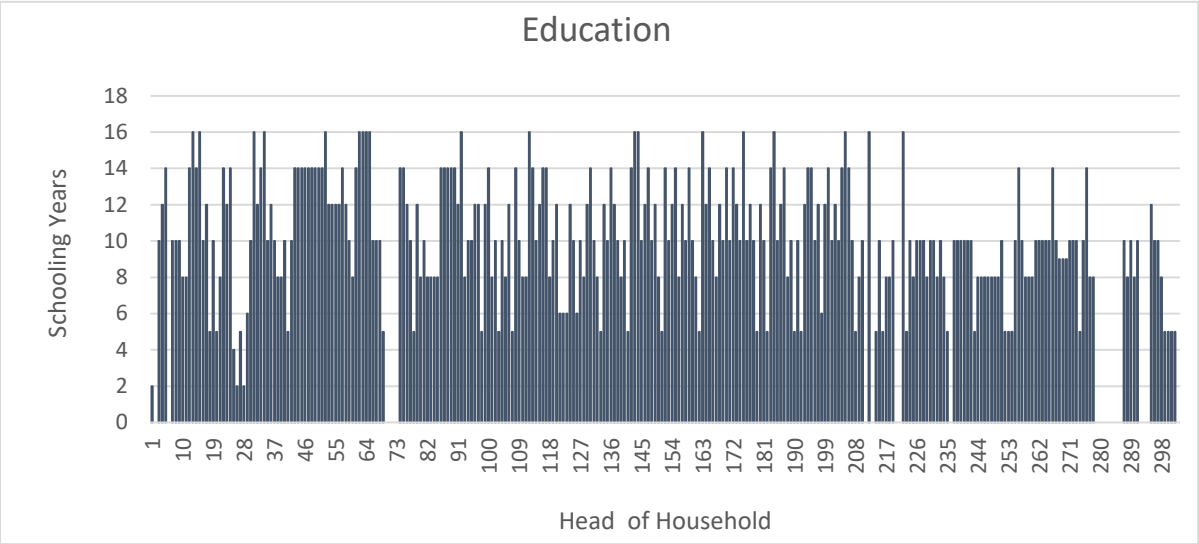

Figure 5.2 Education of Family Members Both Villages