Small Dams in Balochistan are the Key to Uplift Agriculture of the Area: A case Study of Sabakzai Dam in District Zhob

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Abstract

In terms of area, Balochistan is a big province of Pakistan mostly dominated by an arid to semiarid climate. The people of the province are mostly dependent on agriculture and livestock and these sectors are directly affected by the scarcity of water. Zhob district of Balochistan having Sabakzai Dam (SBD) is one of the districts of Balochistan which not only receive winter rainfall from western disturbances but sometimes monsoon rains too. To fulfil the water requirement for cultivation in a semiarid climate the delay action dams are of utmost importance. Most of the people in the study area have access to the Sabakzai Dam (SBD) water for irrigation. The pre-SBD and post-SBD scenarios show that the agricultural land use has increased, and previous barren land has been brought under plough. Also helpful in rising the depleting water table of the area. This is the key to reducing poverty in the region of subsistence economy and will encourage settled life.

KEY WORDS: Agriculture, Irrigation, Semiarid, Livestock, Scarcity, Delay action.

Introduction

The need is felt to harvest rainwater appropriately in drought-prone areas to address subsistence agriculture (**Munyaneza et al. 2016**). Development of agriculture, industrialization and urbanization are almost impossible without an appropriate water supply in the arid and semiarid climate of the province (**Gils, Van and Baig, 1992**). The uplift in the socio-economic development of Balochistan certainly needs the security of water resources (**GOP. 2005**). Balochistan is geographically located in the arid and semiarid region where scarcity of water is always a serious issue (**Ahmad et al. 2014).** It is a vast province remote from the Indian Summer Monsoon (ISM) but still, its economy is based on agriculture and live stocks (**Ahmad et al. 2015**). Thus, adaptation to regional rainfall and climate change is needed to harvest available water resources (**Huq et al., 1999, Rodo, 2003**). According to (**Ambreen et al. 2022**) Balochistan's district Zhob experiences significant rainfall fluctuation. In the wake of rainfall most of the water is lost due to rugged topography, and steep piedmonts additionally the water quickly evaporates back into the atmosphere and eventually, aridity prevails (**Singh and Sontakke, 1996**). In such conditions, small dams are instrumental to

capture water behind the dams to make sure water availability for crop irrigation. SBD is one of the examples to feed the dry lands in Zhob and Killa Saifullah.

The paper is based on existing sources. In the study, area dependency is mostly on subsistence farming. Thus, the water demand is very high in the semi-arid climate of the study area. In this connection, the availability of water resources plays a key role in the uplift of the society living in the

Food and its security are very important for the farming community, their domestic animals, and livestock (**Khan, et al. 2013)** Thus, this issue is of greater interest in semi-arid climates where water availability (no availability) is the prime factor to determine the prosperity of a farming community. The climate of an area determines the source of water for irrigation and this fact is more pronounced in semiarid climates (**Ahmad et al 2015).** In a semi-arid climate like in most parts of northern Balochistan, we need delay action dams to store water for irrigation (**Ahmad, 2005a).** The Sabakzai Dam completed in 2007 significantly enhanced local agriculture and side by side has a positive impact on the biodiversity of the area (**P&D, 2011**) and even strengthened the bond between land and local population. The paper is focused on the impact of SBD on agriculture concerning cereals, vegetables, orchards, and livestock.

Study Area:

Sabakzai Dam is constructed across Sawar Rud (local name of the seasonal stream) which is a tributary of river Zhob, about 68 Km southwest of Zhob Town. The study area is located about 288 Km northeast of Quetta surrounded from all sides by Sulaiman Ranges. The elevation of SBD above sea level is about 1568.84 meters (Pakistan WAPDA, 2022). Geomorphologically, piedmonts, fluvial fans, alluvium deposits derived from the Suleiman Ranges and hills brought by Sawar Rud and another hill torrent. The reservoir area is about 3.73 Km^2 with a maximum operational level of 1590 meters (Pakistan WAPDA, 2022). The Sabakzai Dam is the second largest dam in the province.

Figure 1: Location and geomorphological detail of Sabakzai Dam in Zhob Tehsil

Figure 1 shows detail of the SBD location and reflects that the area is tectonically complicated and geologically deformed. The barren surface with no or less vegetation configures that the area is subjected to rainfall conditions below average. The dark colour patches downstream are the cultivated land of the local dwellers.

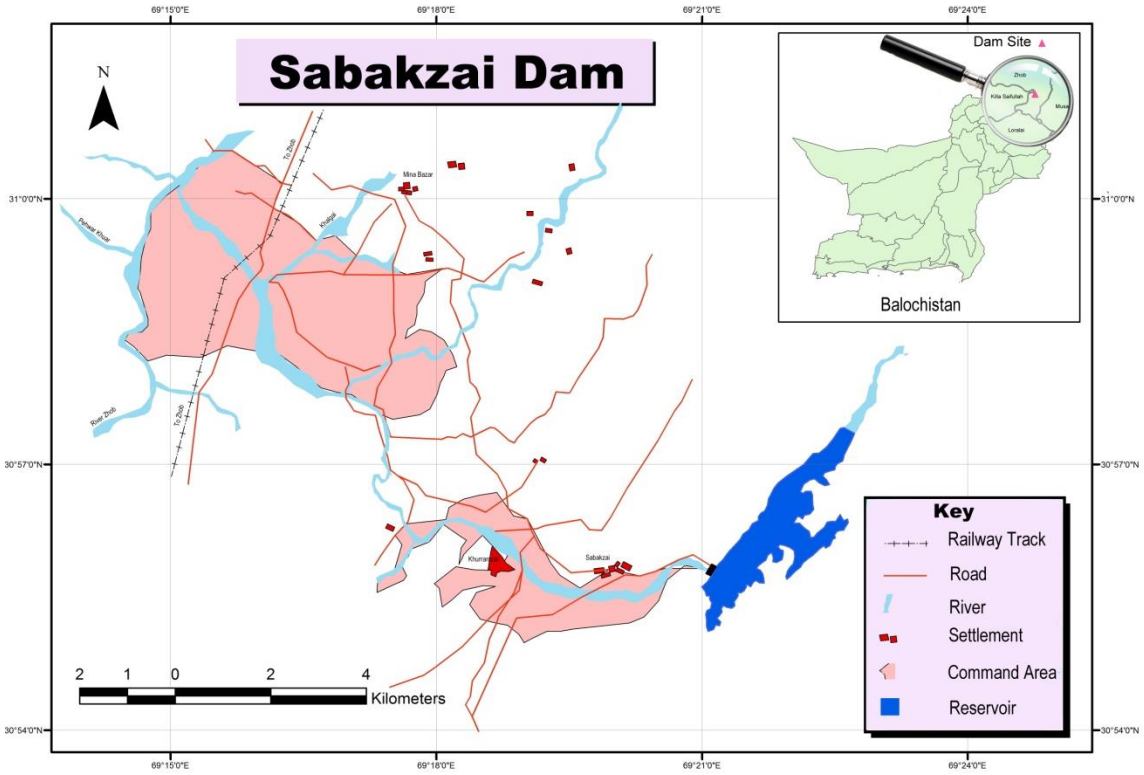


Figure 2. Source: Irrigation Department. The Figure shows detail of SBD reservoir and command area. The map has been mold and made purpose specific.

Most of the dwellers are living in downstream flood plains and their arable agricultural fields are located mostly in active flood channels. Thus, the Dam is dual in function, one it is acting as a delay action dam the other it is performing as a check dam to protect the downstream area from a flood in the situation of rainfall well above average. Cemented water channels have been constructed to pass on the water to the agricultural fields and settlements. The water channels always face the challenge of being flashed in flood, hence at different places channels have been inducted in the small bridge-like structures to avoid the water from being lost in the loose channel deposits. The construction and maintenance of these channels remained always a big challenge for the government and irrigation department. The command area is mostly developed after the water of SBD was brought under use. Mostly the catchment and command area are in tectonically deformed regions.

Material and Method

The work is based on field observations collected through a questionnaire which was prepared after visiting the study area keeping in view its physical and socio-economic condition and the objectives were set accordingly. After testing the initial questionnaire in the field discrepancies were found therefore it was supplemented in two steps after the field visits to achieve the study objectives.

The sampling in the field was based on the following basic principles by (**Arkin and Colton (1963)**

$(n= N/1+ (N\times d^2)$ where

n = sample size,

N = number of people,

While d = error of acceptance.

According to the 2017 census the household in the study area was 15000. 200 questionnaires were filled from the people living there. A random sampling technique was adopted. The analysis was done through SPSS. The maps were prepared from a digital globe and made case specific with the help of ArcGIS.

Results and Discussions

Results are summarized in this section.200 questionnaires were filled from different age groups in the Zhob area of SBD.

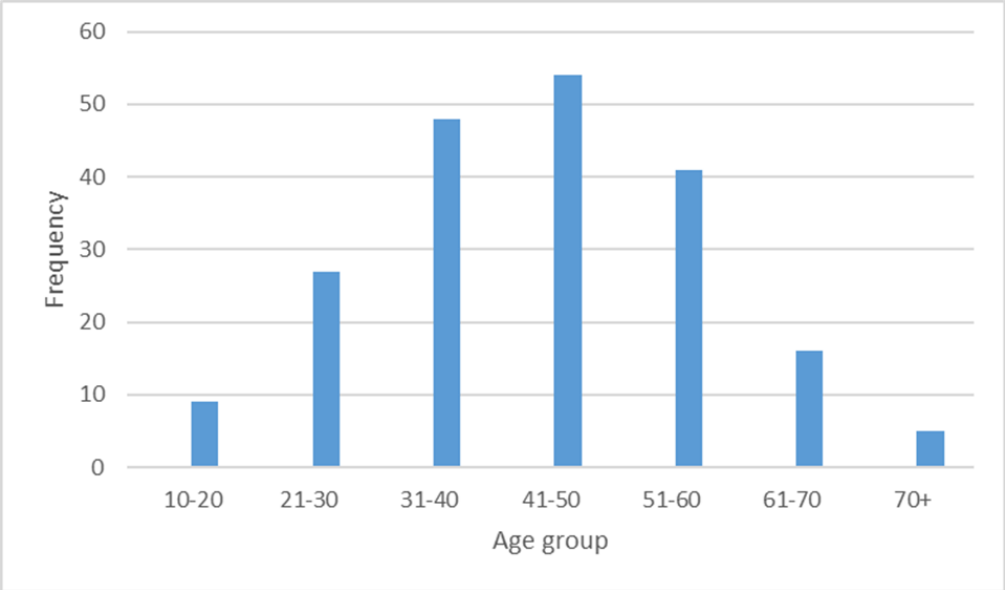


Fig.3. Age groups

The respondents were found in working age groups mostly in the range of 20-70 years. This working group has a big share of the total population and can play a positive role in farming and livestock development. Before the dam, the population was dynamic, and they mostly took their livestock in the areas where water and grass were seasonally available. Now the water for irrigation is available and settled life has been promoted. Eventually settled life is now followed by various projects of development by the government and NGOs.

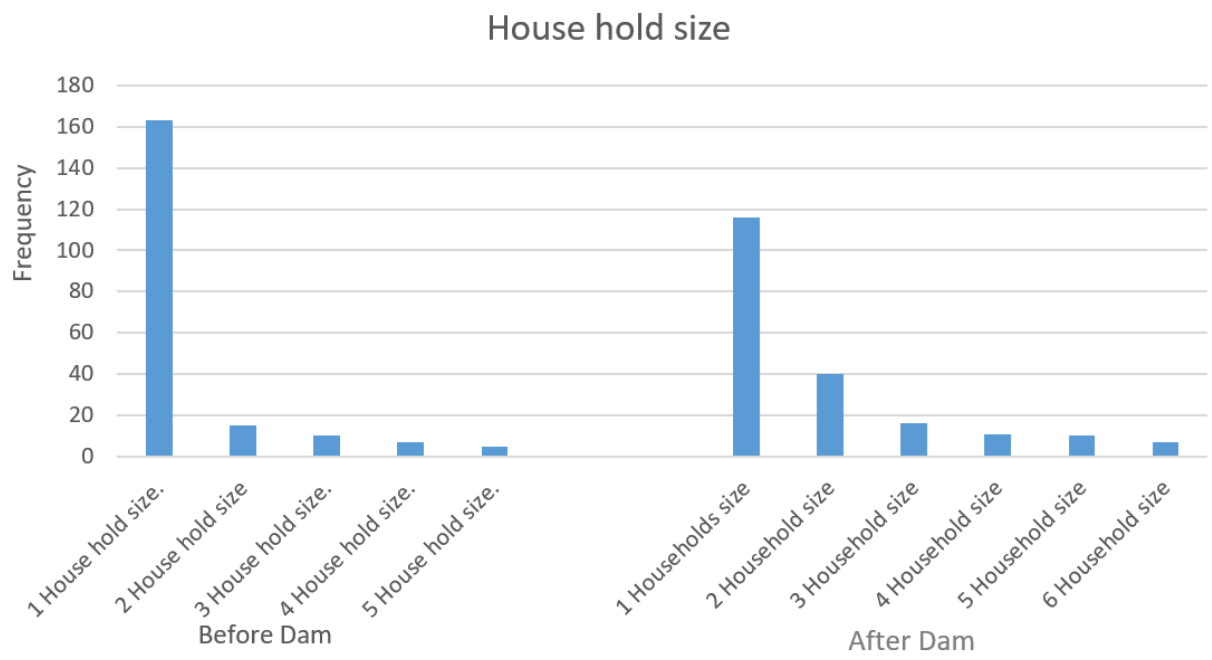


Fig.4a House hold size before dam.

Fig.4b House hold size after dam.

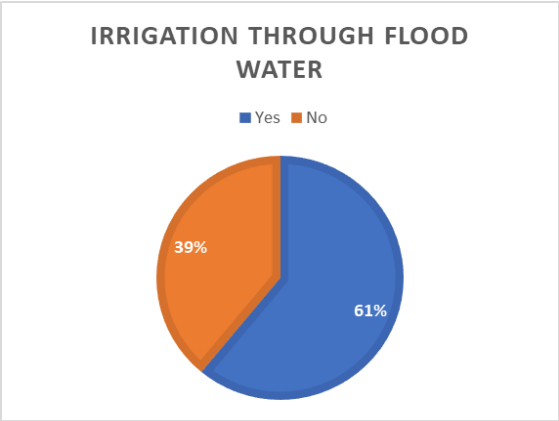
House hold size

Based on field information (Figure 4a and Figure 4b). Household size is one of the important indicators of living standards. Previously there was a maximum number of dwellers in a single house where life standard was negatively affected. Now after the SBD is in operation the single household size with the maximum number of inhabitants has decreased.

Water used for agriculture

Before the construction of the dam, 61% of respondents use flood water for agricultural purposes. As the majority of Karezes in the study area are dried or have low water capacity due to droughts and because of high load shedding, not everyone is using electric tube wells. So, most people depend on flood water for agriculture which is sometimes good production and when there is low rain the production is also low.

After the construction of the dam, 80.5% of respondents are irrigating through the dam water. The respondents also reported an increase in orchard production as compared to it in the past Karez and flood water. Figure 5a and 5b below shows the use of water for agricultural purpose before and after the SB Dam construction.



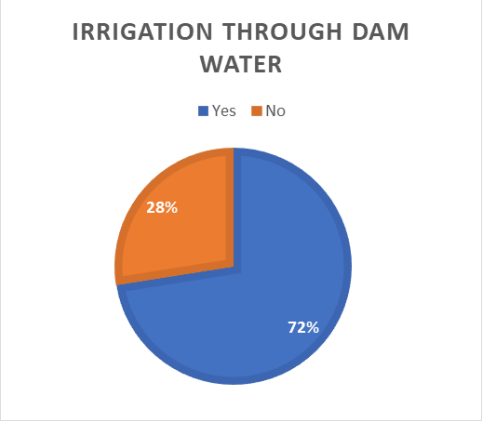


Fig.5a. Irrigation before Dam

Fig 5.b. Irrigation after Dam

Increase in Agricultural land

According to figure 6. cultivated land increased after continuous supply of water through SBD. Before the construction of dam small acreage land were under cultivation due to less supply of water like 1-5 acres. After SBD completion water supply started in the area which not only increased the cultivated land bit also the number of bigger size land.

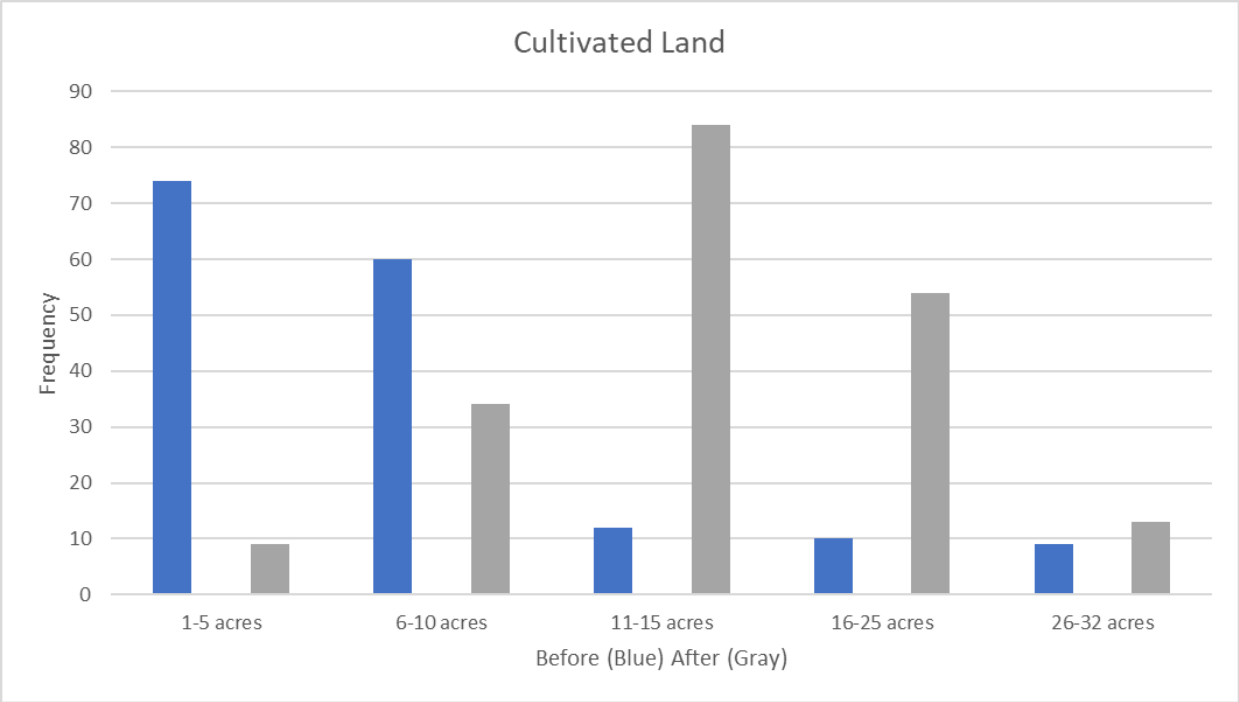


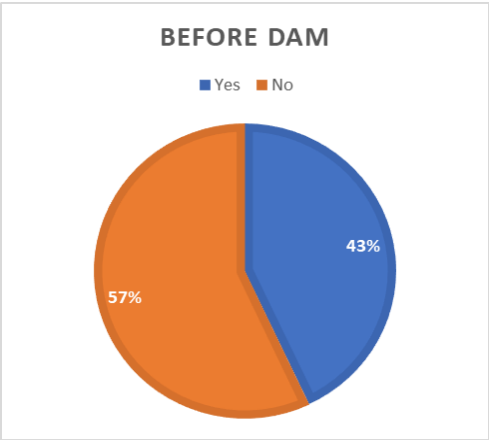
Figure.6

Livestock

Once livestock production in the study area was on the top. In the past majority of people depend on livestock for their livelihood. But it decreased slowly when the 1998 drought began.

The Pakistan Meteorological Department has carried out research (**Chaudhry et al.2009**) Pakistan's precipitation was significantly impacted by El Nino, which resulted in a sharp reduction in both summer and winter precipitation. El Nino-induced precipitation scarcity, both in terms of duration and intensity, resulted in the greatest drought in Pakistani history, which lasted from fall 1998 to spring 2003.

After the construction of the SB dam, the number of livestock owners increased in the study area. Before the SB dam, 43% of respondents reported that they own livestock but after the construction of the SB dam, this number has increased to 72.5%. The figure 7a and 7b below show the livestock owners before and after the SB dam



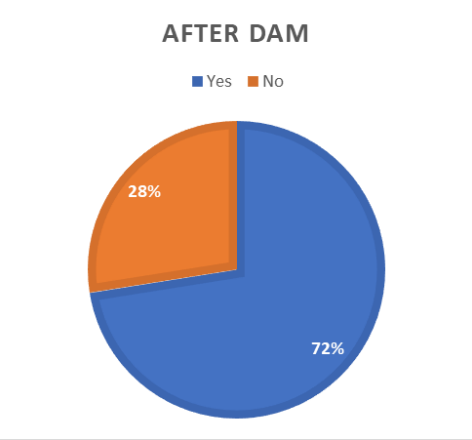


Fig.7a.Livestock before Dam.

Fig.7b.Livestock after Dam.

Change in Agriculture

Respondents were asked about the production of different vegetables and orchards before the construction of the dam and after the construction of the dam whether they are growing or not. Their responses are shown in the table below where almost there is an increase in every item after the construction of the dam as more people are growing different vegetables and fruits. A large increase in Spinach cultivation as respondents reported who were cultivating Spinach before the construction of the SBD was 22.5% while after the construction of the dam the number has increased to 40%. Likewise, an increase was seen in other vegetables also as Turnip cultivating respondents has increased from 15.5% to 35% and Onion from 23% to 36.5%. While Maize cultivating respondents have decreased to 45% as it was 75% before the dam construction. The percentage of respondents cultivating orchards has also increased after the dam construction. 45% of respondents are cultivating Apple after dam construction while this was 20% before the dam was constructed. Similarly, results show Pomegranate 15.5% to 35.5% and Peach 10.5% to 21.5% before and after dam construction.

Respondents were also asked about the production of other crops and their responses are shown in the graph below. The number of Tomato growing respondents has increased from 23% before the construction of the dam to 50% after the dam construction. An increase has also been reported in tobacco and cucumber growing respondents. While a slight decrease has been reported in watermelon growing respondents.

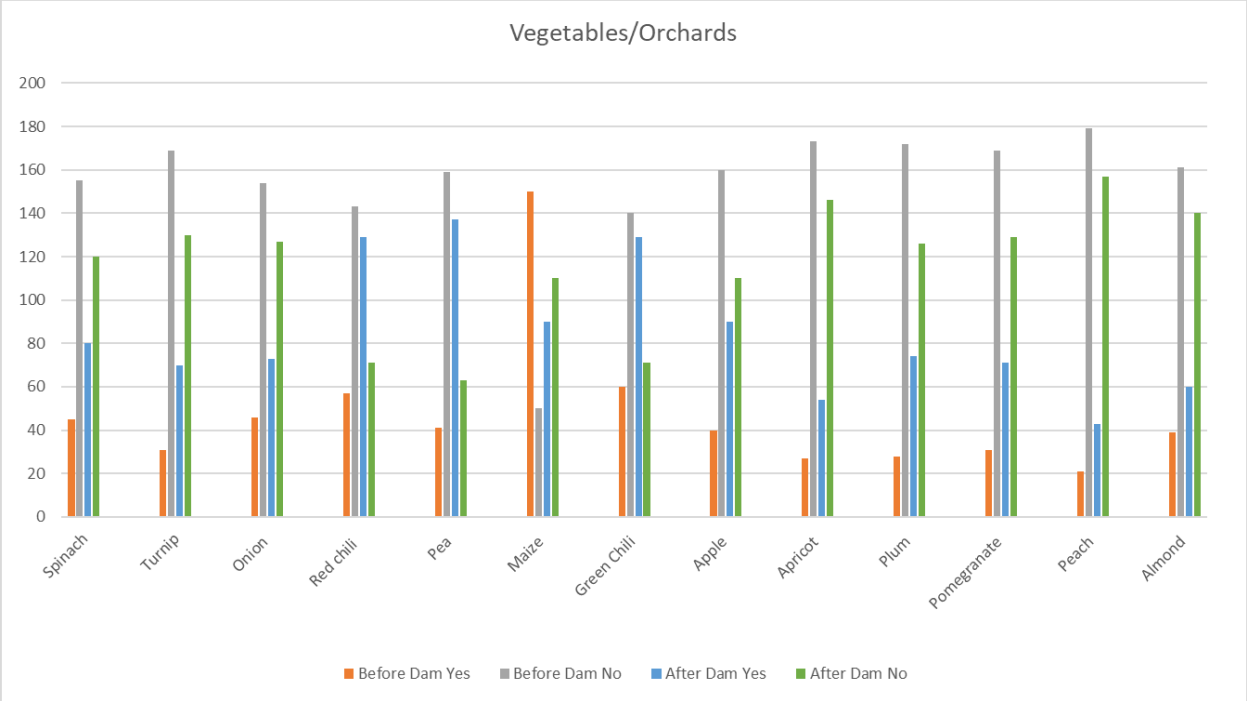


Fig.8. Change in agricultural production.

Conclusion

It is a case study and configures how SBD in geomorphological and climatic conditions influence the local population through its impact on agriculture. The objective is to check the change in agricultural land use before and after the construction of SBD. To achieve such a goal field survey was conducted by choosing a sample size of 200 households. The results show that marked socioeconomic development is shown after the construction of SBD.

Zhob receives winter rainfall from western depressions and sometimes from monsoon too (). The variability of this monsoonal rainfall is one of the primary causes of hydrological disasters, such as floods or drought, particularly in the southern portions of the country (**Adnan et al. 2015**). Such meagre rains bring drought to the area. A high coefficient of rainfall Variation is also observed. Natural disasters like drought are brought on by low rainfall (**Rafiq et al. 2022**). That is why District Zhob is one of the drought-prone areas in Balochistan (**Ashraf et al. 2021).** The provision of water for sustainable development is required in the study area. Rainfall erraticness and the pattern of exceptionally high or low precipitation are important variables for the country's agriculture and economy. It is well acknowledged that both globally and regionally, variations in rainfall are caused by global warming. Rodriguez-Puebla et al. (1998), Lambert et al. (2003), Dore (2005), Hulme et al. (1998), Gemmer et al. (2004), Kayano and Sans'golo (2008).

The value of water has significantly increased today because of rapid population growth, economic development, and other issues that have an impact on natural resources.

According to the World Water Development Report 2015's opening line, "water is at the core of sustainable development" (UNESCO-WWAP, 2015); this development is closely linked to the availability and accessibility of sufficient quantities and qualities of water for the preservation of healthy ecosystems and is essential for socioeconomic and human development. A dam-like SBD has raised the socioeconomic condition of the area. Water availability through the dam increased the agricultural production of the area. The aridity of Balochistan demands such kind of small delay action dams in other areas too. As it will help in poverty reduction, provision of food as well as upgrading the standard of living.

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