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Impact of Mixed Farming on the Socioeconomic Conditions of Small-Scale Farmers in Tehsil Mankera District, Bhakkar

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ABSTRACT

The research study investigates the mixed farming attributes of farmer's households concerning socioeconomic conditions and services provided in the study area. The baseline survey was executed to investigate the indigenous farming activities, socioeconomic conditions of the local community, and services provided in Tehsil Mankera, District Bhakkar. 200 farmers' households from 20 stations and eight union councils were selected for the baseline survey. Ten farmers' households from each village were selected with random sampling. The results revealed that the study area comprised three types of cultivation: tube well cultivation was 17%, canal cultivation was 4%, and rain-fed cultivation was about 79. The total cultivated area was 88%, and significant Rabi crops were Gram (the primary source of their livelihood), wheat (the local staple food of the farmers) with fodder like alfalfa and mustard. The main Kharif crops were pearl millet (bajra) and cluster bean (guar seed). The farmer's households have an average of 2-6 cattle at home. The area is mainly rain-fed with poor health, education, water, sanitation, and electricity facilities. Most of the farmers' households' land is under 5-10 acres with poor quality that is difficult to cultivate. Poverty prevails in the study area. Agriculture and livestock herding are their livelihood strategies. Expenditures are far more than the annual income of farmer's households. Farmer's households live below the poverty line.

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1. Introduction

Mixed farming" comprises crop cultivation and livestock rearing. The relevance of mixed agricultural methods, which involve paired interactions between crops and livestock, is rising. The most prevalent type of farming in the world is mixed farming. Whether livestock grazes on public or private lands or in plantations, it occurs where livestock adds value to crop products, diversifies crop rotations, and aids in nutrient recycling. Farmers with limited access to resources practice mixed farming (Powell & Williams, 1995). Four aspects must be considered when assessing technology impacts on crops and animal integration. It is a biological and technical perspective, social acceptability, economic viability, and ecological soundness (Norman, 1995). In emerging nations, small-scale farms are essential to the rural economy and farmers' poverty alleviation. However, in recent years, small-scale farmers have encountered numerous financial, technological, and legal difficulties. Different countries have specific examples of crop-animal interactions, and the results of several case studies are available. It describes the critical roles of animals' contribution in increasing farming systems' capacity for productivity, income creation, and sustainability (Devendra, 1997). There is a view that when scientific research integrates with local knowledge, there is a possibility for sustainable and innovative development. The area's land production, food security, and socioeconomic performance may significantly improve after implementing a "best practice" mixed farming systems management method (Monzote et al.,

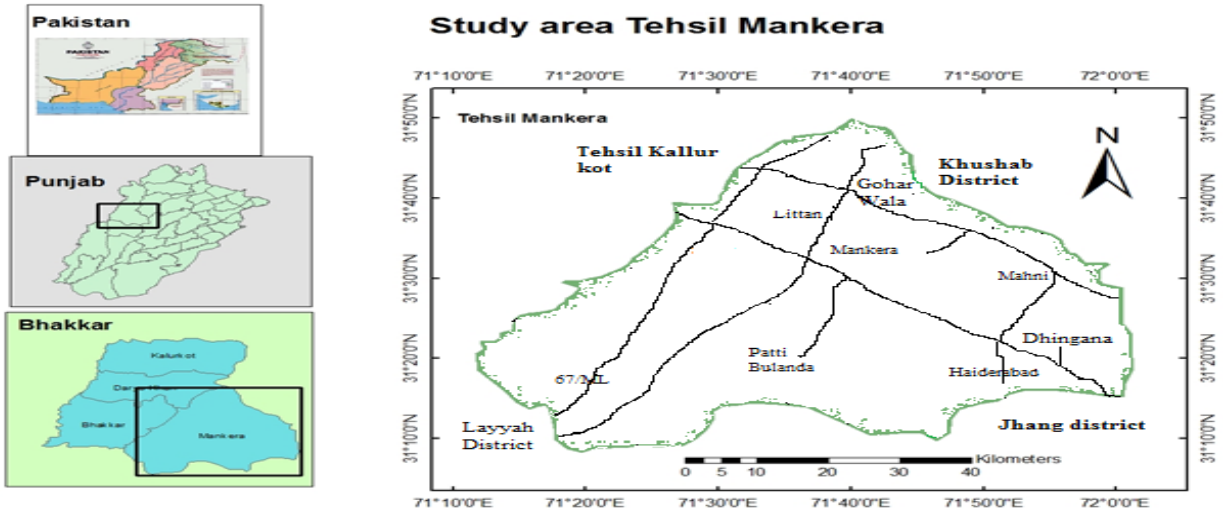
2012). The socioeconomic condition is vital for development and essential to consider the interactions between Pakistan's economic and social systems to assess the benefit of development. The social sector is a long-time ignored sector. The underdeveloped human capital of Pakistan is a serious concern (Alderman, Behrman, Ross, & Sabot, 1996). Mixed farming usually has small land areas with low agricultural yield and food shortages (Herrero et al., 2010). 60% of Pakistan's population lives in rural areas, where most suffer from poverty and rely on agriculture for survival. Pakistan has a high poverty rate among small landowners. Tehsil Mankera District Bhakkar is located in arid (Barani) conditions and between the Indus and Jhelum rivers. Due to its proximity to the Indus River and lack of vegetation in the east, the land is more productive on its western side. The area of the district is rain-fed, and due to the lack of schools, primary health units, electricity, water, or sanitation facilities, people suffer from bad financial and living conditions including a lack of property and transportation (Ingram, Roncoli, & Kirshen, 2002). The main characteristics of mixed farming are small farms, poor agricultural output, and a food deficit. 60% of Pakistan's population lives in rural areas, where most struggle with poverty and rely heavily on agriculture for survival. Small landowners have a high poverty rate. For the abovementioned aspects, a research study was launched in Tehsil Mankera to investigate the mixed farming activities about the socioeconomic condition of the indigenous farmer's household and government steering to promote the local population and diverse farming activities.

2. Material and Methods

2.1. Study Area

The study area Tehsil Mankera is 31o 22' 59.99" N and 71o 25' 59.99" E latitude and longitude 45 km east of District Bhakkar. It is a typical arid town with eight union councils. The study area's population is 256895, with a density of 145.3/km2. The rural population is 94.5% having a 48.9% literacy rate (Census, 2017). Saraiki is the primary language, while Punjabi, Urdu, and Pashto are secondary.

Figure 1



2.2. Data Collection

The preliminary information was collected on the location map of the study area. Tehsil Municipal Administration (TMA) Mankera and Agriculture Extension Department (AE) were the primary sources of information about the study area's mixed farming locations. The selection of sample villages (chakuk/mouza) for the baseline survey was based on preliminary information from concerned departments. Secondary data sources were government departments, including Union Council, Health, Revenue, Agriculture, and Livestock Department.

3. Results and Discussion

3.1. Socioeconomic Conditions of Farmer's Household in Study Area

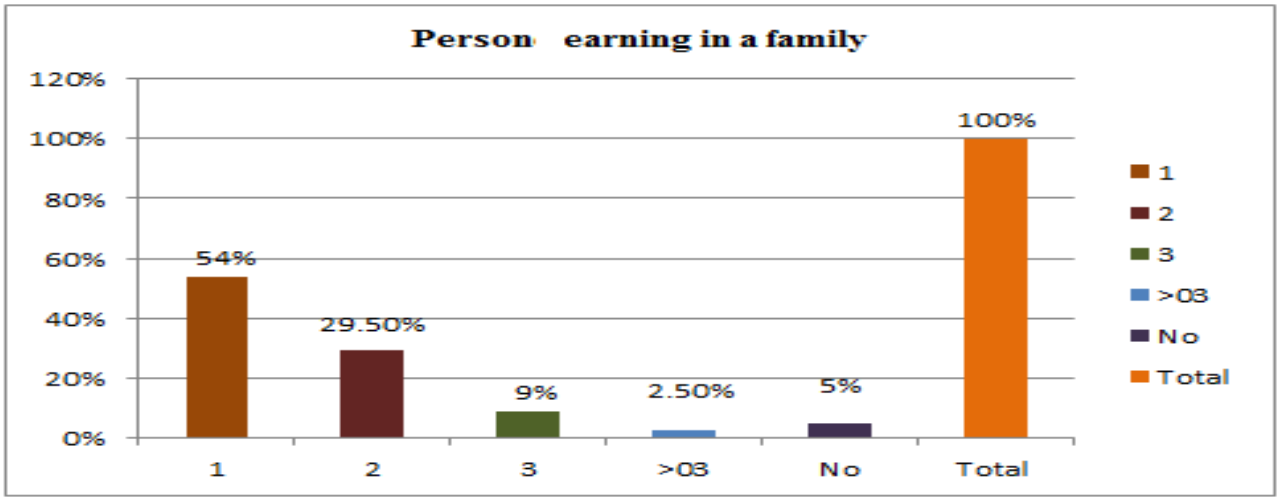
The socioeconomic conditions of farmer's households in the study area are significantly influenced by income levels and educational attainment. Low income levels restrict their access to basic necessities and limit their potential for growth. Limited educational opportunities impede their ability to adopt modern agricultural practices and engage in non-farm income-generating

activities. To improve these conditions, it is crucial to implement policy interventions that focus on income diversification, access to credit and financial services, education and skills development, infrastructure development, and improved healthcare and sanitation facilities. By focusing on these crucial areas, farmer households' socioeconomic conditions can be improved, supporting sustainable agricultural development and rural prosperity.

3.2. Persons Earning in Farmer's Household

The number of people who contribute to the family income by working and meeting their basic requirements is one measure of the socioeconomic circumstances of the farmer's families. Since joint families are common in rural areas, one or two people typically have to provide for the entire family financially. The study looked at how many people lived in the families of the farmers and what their sources of income were. The findings revealed that less than a third (29.5%) of farmer households had two earners, while more than half (54%) were dependent on a single earner. A very tiny percentage (2.5%) of the farmer's households (or just 9%) had more than three wage earners. However, 5% of the farmer's households had no wage earners, which meant they had to rely on social assistance, pensions, or other outside sources of income. Figure 2 shows how the homes of farmers are divided by the number of earners.

Figure 2: Income Levels of the Members of a Farming Family



Farmers' households are likely to have low and unstable incomes due to their reliance on agriculture and livestock, which are susceptible to climate and market risks. Furthermore, their capacity to raise their standard of living and absorb shocks is constrained by the absence of diversification and alternative revenue streams. Therefore, it is necessary to improve the households of farmers' ability to generate money, as well as to give them access to financing, markets, and social safety.

3.2.1. Family Heads Education of the Farmer's Household

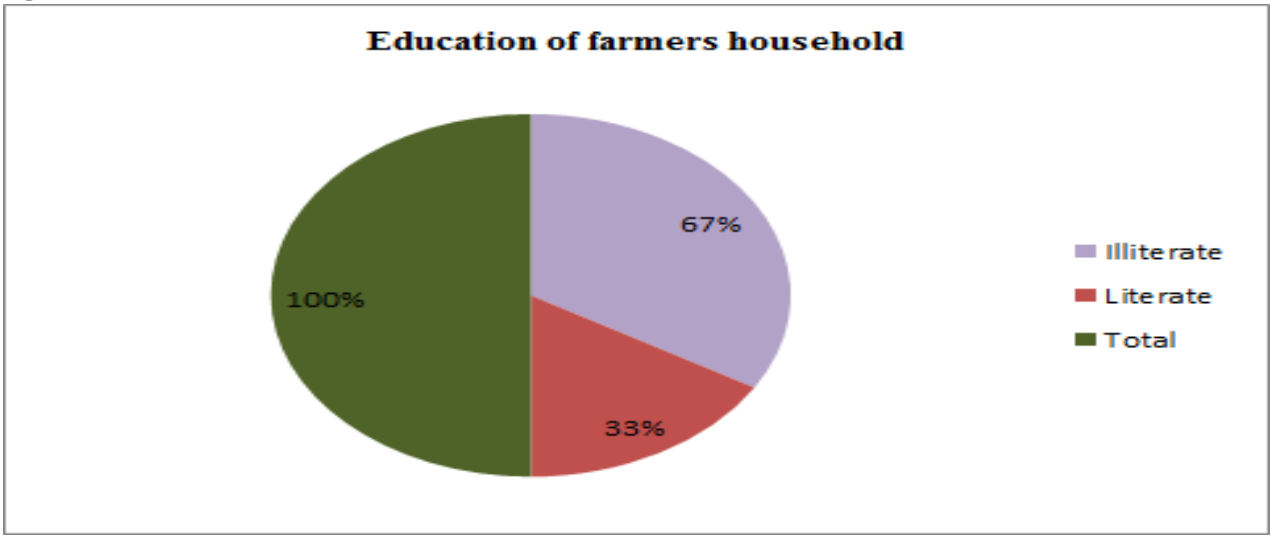
Another indication of the socioeconomic status of the farmer's families is the level of education attained by the family head. The head of the family is essential for overseeing household finances and making decisions that affect the welfare of other family members. The income and social standing of the family head and the household as a whole are significantly influenced by education. As found in earlier research (Khan & Khisha, 1970), educated farmers have better access to knowledge, technology, markets, and credit, allowing them to boost their production and revenue. Additionally, educated farmers participate in more community activities and have better social capital, which increases their social recognition and empowerment (Khan & Khisha, 1970).

The education of the family head in the farmer-occupied households in the research region was looked at. The standard for literacy was the ability to read and write a straightforward letter in Urdu, Pakistan's official language. As illustrated in Figure 2, the findings showed that only a minority (33%) of the family heads of the farmer's households were literate, while the majority (67%) were illiterate. The lack of educational institutions and facilities in rural areas, the high opportunity cost of education, the low awareness of the benefits of education, and the cultural

and religious barriers that discourage education, especially for women, are a few reasons why the family heads of farmer's households have a low literacy rate (Khan & Khisha, 1970).

The findings show that because of their low levels of education, the farmer's households confront several difficulties and restrictions. They have few chances to increase their incomes and manage hazards. They also participate little in their communities and have little social status. In order to encourage education among farmer households, it is necessary to build them suitable and accessible educational institutions and amenities. Their socioeconomic situation can be improved, and education can equip them with new knowledge, abilities, and attitudes that will enable them to make wise decisions.

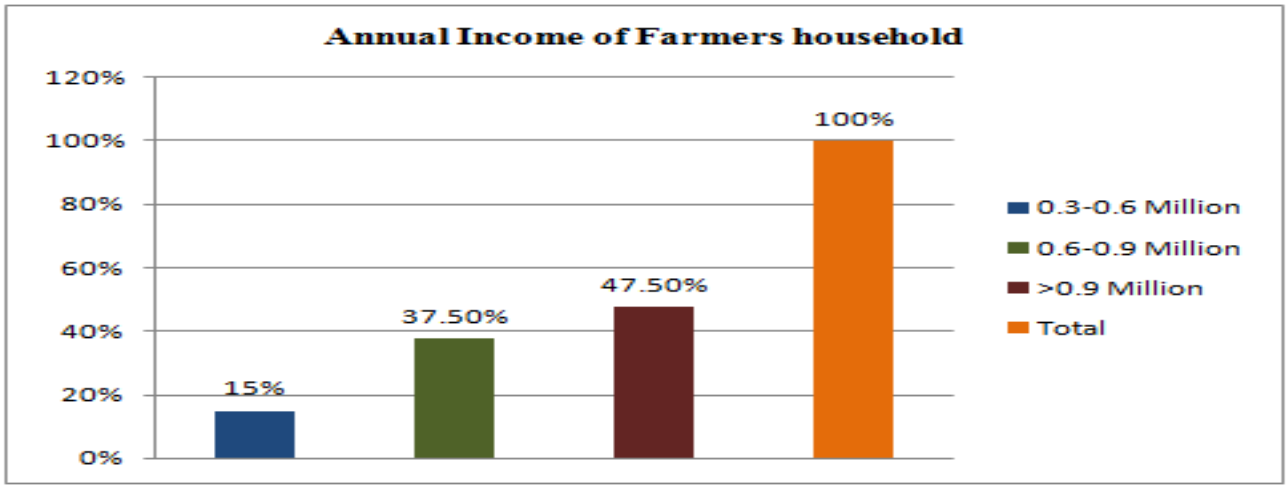
Figure 3: The Farmer's Household Head's Education



3.2.2. Farmer's Household's Annual Income in Tehsil Mankera

For the majority of the agricultural households in the study area, agriculture was their primary source of income. The study area, however, was a desert region with only a few areas suitable for farming. The farmers were forced to level the low-lying dunes and irrigate using tube wells. This was very costly and difficult for the farmers, who mostly belonged to low-income groups. The high price of petroleum and tubewell irrigation posed a major challenge for them. The annual income of the farmer's household was low.

Figure 4: Household income of farmers in Tehsil Mankera



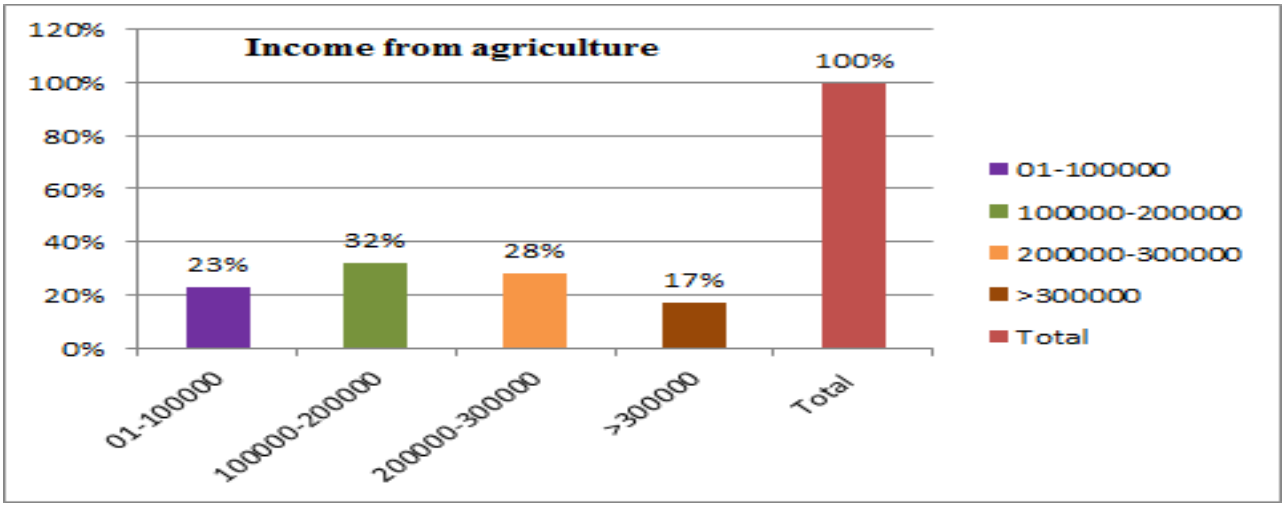
The distribution of the farmer's household's yearly income in Tehsil Mankera is shown in Figure 4. The results indicate that less than half (47.5%) of the households had an annual income of more than 0.9 million PKR, while more than a third (37.5%) had an annual income between 0.6 million and 0.9 million PKR. Only a small fraction (15%) had an annual income between 0.3 million and 0.6 million PKR. The highest annual income was 4000 USD, which was very low

compared to the average income in Pakistan. These farming families faced many hardships due to the high inflation rates.

3.2.3. Annual Income from Agriculture

Crops such cereals, legumes, oilseeds, fibres, fruits, vegetables, flowers, spices, fragrant plants, and plantation crops were all included in the agricultural revenue.

Figure 5: Household Incomes Derived from Agriculture



The distribution of the farmer's household's yearly revenue from agriculture is shown in Figure 5. The results showed that the majority (60%) of the respondents had an annual income from agriculture between 1 and 3 lacs, while less than a quarter (23%) had an annual income from agriculture between 0 and 1 lac. However, Tehsil Mankera is a desert area where most of the population depends on rain-fed agriculture; therefore, the annual income from agriculture is uncertain and vulnerable to rainfall variability. Moreover, there is no industry in the area due to the topography and the lack of development. The low annual income from agriculture poses a challenge for the farmer households to sustain themselves. Some of them have to work as laborers to supplement their income.

3.2.4. Annual Income from Livestock

The value of the products from cattle, poultry, sheep, and goats was included in the revenue from livestock. In addition to providing valuable goods that may be produced utilising small-scale, household-based production systems, livestock is a crucial part of sustainable rural development since it is often more robust and less subject to key harvest timing than many crops (Khan & Khisha, 1970).

Figure 6: Household of a Farmer's Annual Income from Livestock

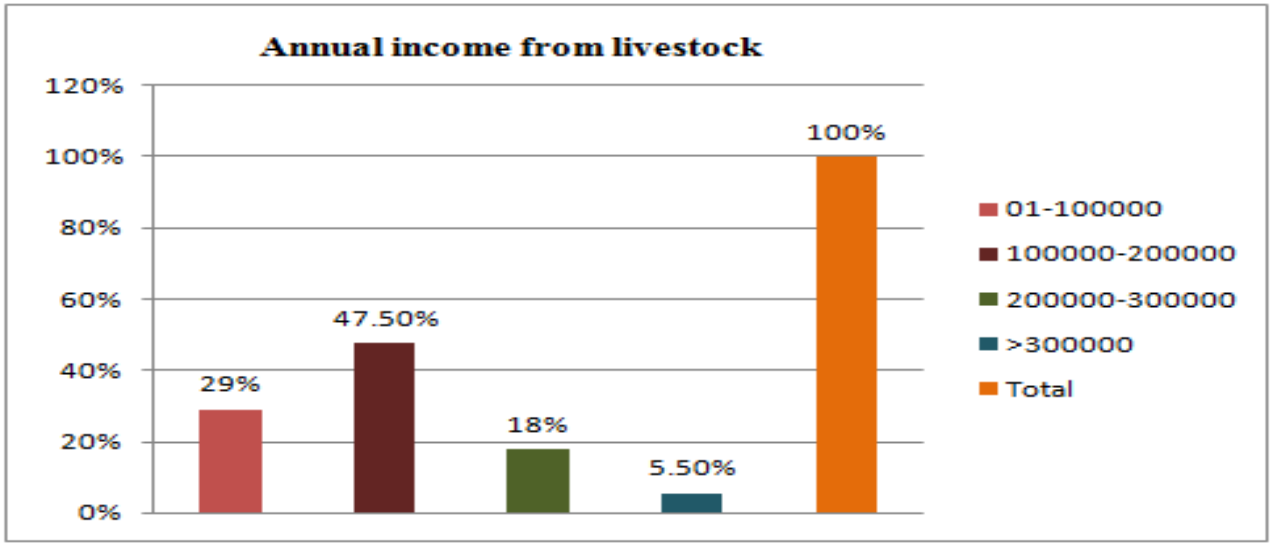


Figure 6 shows the distribution of the annual income from livestock of the farmer's household. The results indicated that more than three-quarters (76.5%) of the respondents had an annual income from livestock between 1 and 2 lacs, while less than a fifth (18%) had an annual income from livestock between 2 and 3 lacs. Only a few (5.5%) had an annual income from livestock above 3 lacs. In Tehsil Mankera, most of the farmers had small landholdings and also had a limited number of cattle and animals for their subsistence needs. The income from livestock was very low due to the lack of infrastructure and poor marketing facilities.

3.2.5. Off-farm income of Farmer's Household

Included in the income from non-farm sources were wages, salaries, and profits from non-farm businesses. However, in this dry region, there is a dearth of appropriate markets, industries, and infrastructure that may offer rural residents possibilities for off-farm employment.

Figure 7: Farmer's Household Incomes in Tehsil Mankera from other Sources

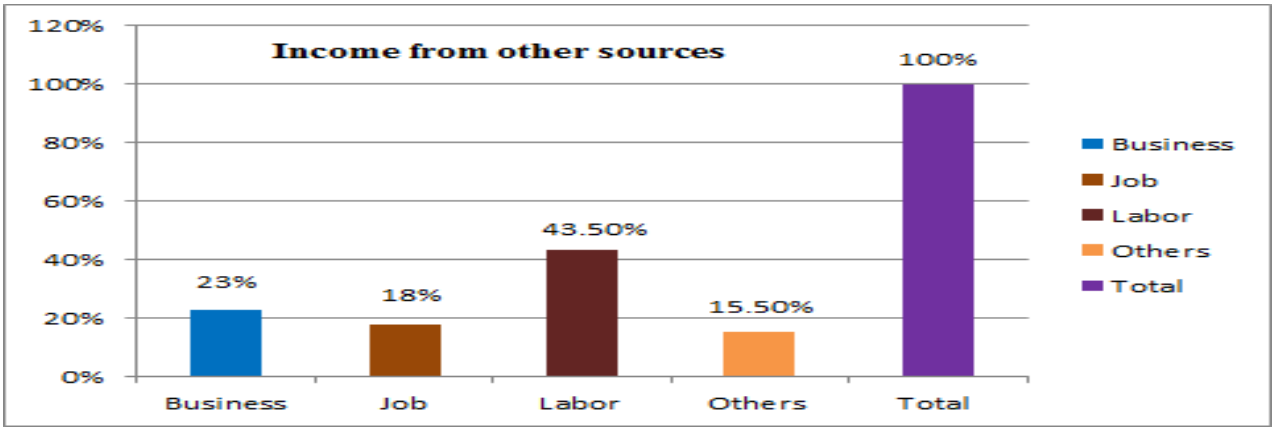
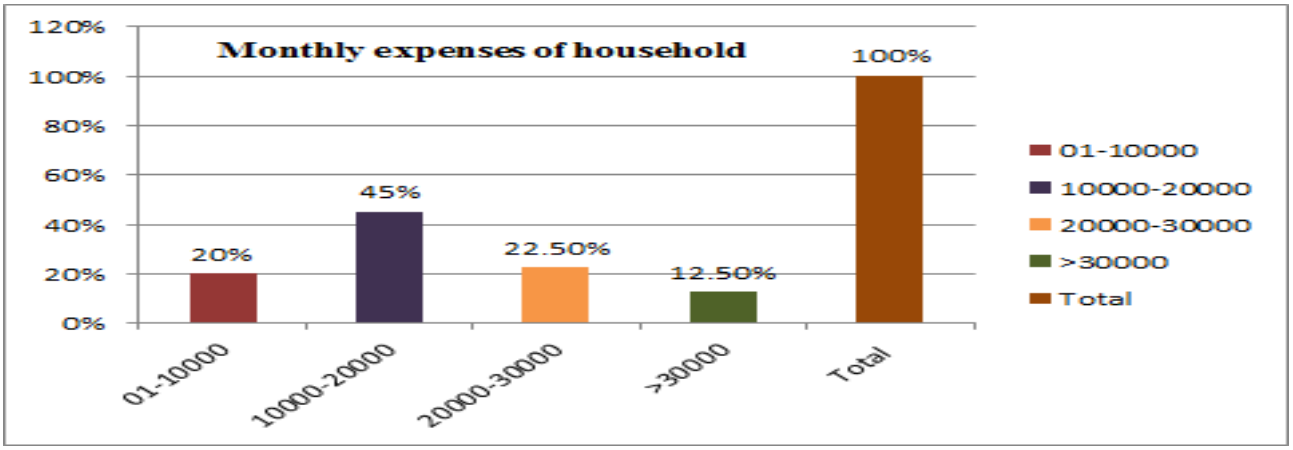


Figure 7 shows the distribution of income from various sources among the farmer's household in the Tehsil of Mankera. The findings revealed that labour work, which made up 43.5% of the sample, was the most typical form of off-farm income. The second most common source of off-farm income was business, which accounted for 23% of the sample. The third most common source of off-farm income was a job in the government or private sector, which accounted for 18% of the sample. The remaining 15.5% of the sample had other sources of off-farm income, such as remittances, pensions, or social assistance. As discussed in the previous figure, most of the people relied on agriculture as their main source of income and had less interest or access to jobs; therefore, 43.5% of the sample worked as laborers.

3.2.6. Monthly Expenses of Farmer's Households in Mixed Farming Areas

The household economy of the farmers is one of the most important aspects that reflects their living conditions. The household expenditures of the farmers can reveal their living standards based on their consumption patterns (Deaton & Paxson, 1998). The main categories of household expenditures of the farmers are related to lifestyle, health, clothing, food, housing, transport, and others.

Figure 8: Farmer's household total monthly expenses in Tehsil Mankera



The distribution of the farmer's household's total monthly costs in Tehsil Mankera is shown in Figure 8. According to the findings, the majority (45%) of respondents reported monthly costs of between 10,000 and 20,000 rupees, the respondents' greatest expense range. The second largest proportion (22.5%) had total monthly expenses between 20 and 30 thousand rupees. The third largest proportion (20%) had total monthly expenses between 1 and 10 thousand rupees. The smallest proportion (12.5%) had total monthly expenses above 30 thousand rupees. Most of the study area in Tehsil Mankera was covered by dunes, and there were few irrigation facilities available. The farmers depended on rain-fed agriculture for their income, which was uncertain and low. However, despite having a low annual income, their expenses were high. They spent more on non-food items due to the location of the study area, which increased their transport and housing costs. They spent less on food items because most of them had food crops in their own farms.

3.3. Mixed farming activities of farmer's households in Tehsil Mankera

Growing crops and raising livestock are included in the practice of mixed farming. The relevance of mixed agricultural methods, which combine interactions between crops and livestock, such as cultivating with animal waste and dung and feeding animals crop residues, is rising. Small-scale farmers have a significant role in crop production all over the world. The most prevalent type of farming in the world is mixed farming (Devendra, 1997). It exists everywhere livestock is used to increase crop product value, diversify crop rotations, and assist in nutrient recycling, whether the animals graze on public or private lands, plantations, or both. Numerous farmers worldwide use hybrid systems with limited resource access (Powell & Williams, 1995).

3.3.1. Nature of Agriculture Land in Mixed Farming Area

The availability and management of water resources are crucial for the sustainability and productivity of agriculture, especially in the context of increasing food demand and climate change uncertainty. In order to satisfy future food demands, greater water management investments are required, according to the Comprehensive Assessment of Water Management in Agriculture. Rain-fed agriculture will continue to be a major source of food and income, especially in developing countries. The rain-fed areas are the hotspots for water, food, and livelihoods challenges (Rockström et al., 2010).

Figure 9: Nature of Agriculture Land in Tehsil Mankera

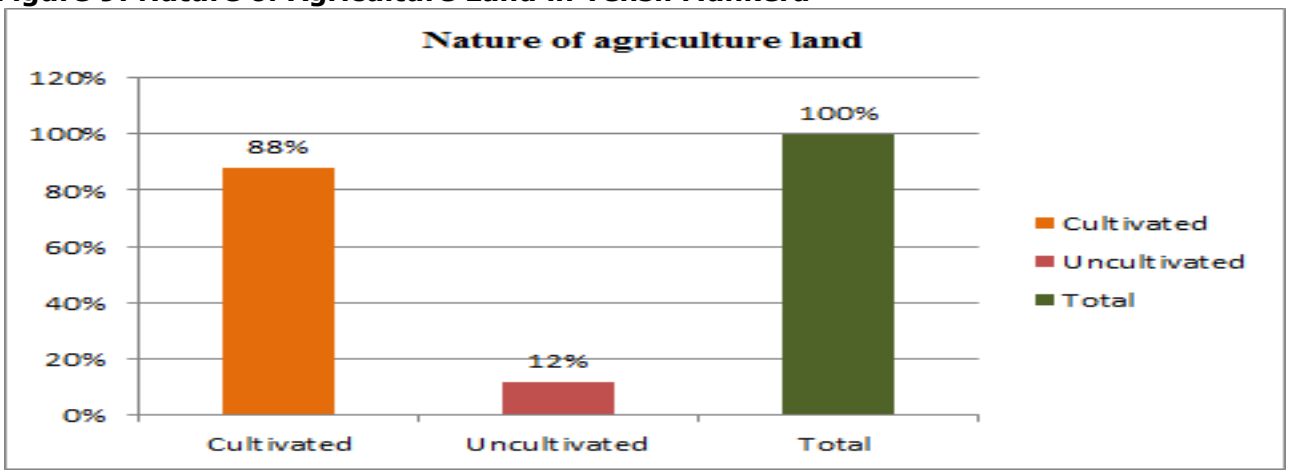


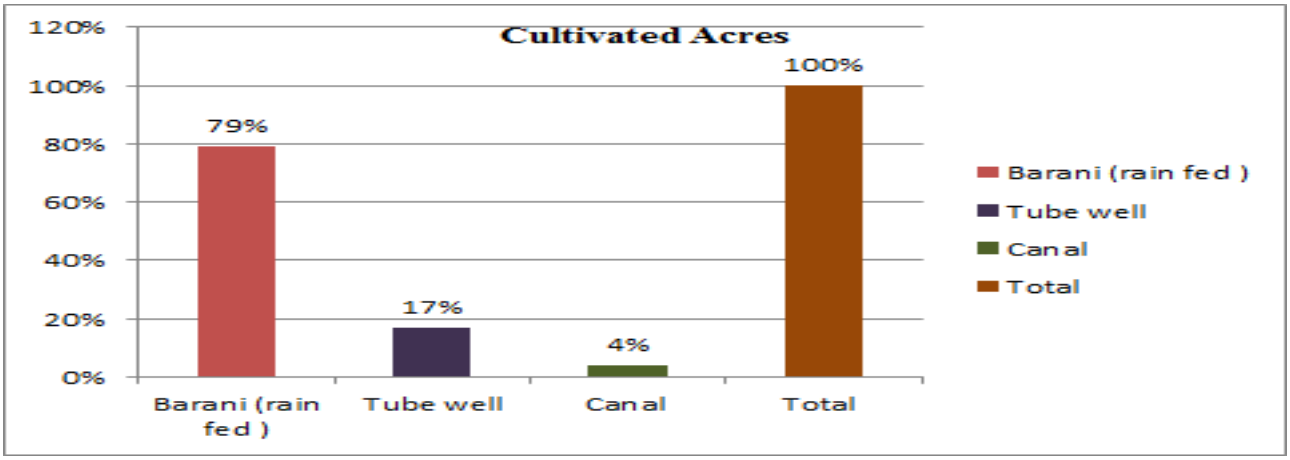
Figure 9 shows the nature of agricultural land in Tehsil Mankera. The results showed that out of the total land available in the mixed farming area, 88% was cultivated and 12% was uncultivated. Out of the cultivated land, 88% was under cultivation, and 79% was rain-fed. Only 17% of the land was irrigated by tube wells, and 4% by canals. The main crop grown in this rain-fed area, which was mostly composed of dunes, was gram, which was the main source of income for the local people. The uncultivated land consisted of rakh, a barren area with bushes and grass mainly used for grazing cattle, and uncultivated forest land. Most of the uncultivated land was owned by the government as state property.

3.3.2. Acres of Barani (rain fed), tube well, and canal-cultivated land in the Tehsil of Mankera

Figure 10 shows the cultivated acres of land in Tehsil Mankera according to the type of irrigation. The results indicated that there were three types of irrigation in the study area, which

were Barani (Rain fed), Tube well, and Canal. Barani (Rain fed) was the most common type of irrigation, as it covered 79% of the cultivated land. This was because Tehsil Mankera was a desert area, where only rain-fed agriculture was possible. The main crop grown under rain-fed irrigation was Gram, which occupied about 79% of the land. The farmers in this area depended heavily on the rainfall for their crop production. The land used for rain-fed agriculture was low-lying land next to a dune, which was cleared and leveled by the farmers using tractors. Tube well irrigation was the second most common type of irrigation, as it covered 17% of the cultivated land. However, this method was very costly and difficult for the small-scale farmers, as the sandy soil required more water for irrigation and the diesel prices were high. Canal irrigation was the least common type of irrigation, as it covered only 4% of the cultivated land. This was because there were few canal facilities available in the area.

Figure 10: Tehsil Mankera's Cultivated Acres of Land



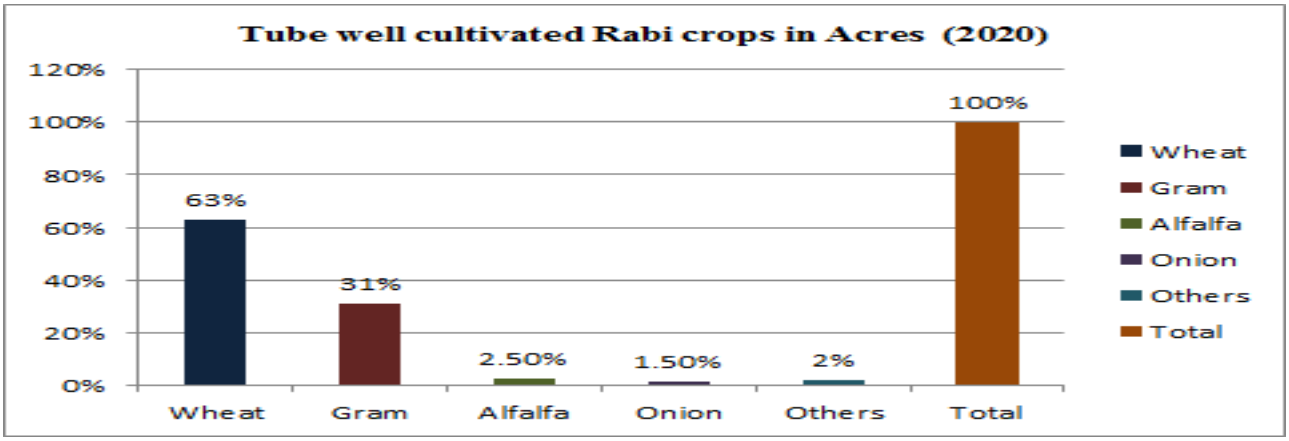
3.4. Rabi and Kharif Agricultural Crops Cultivation in Tehsil Mankera

The two primary growing seasons in Pakistan are "Kharif," or autumn crops, which are sown in April and harvested in October and December, and "Rabi," or winter crops, which are planted in October and harvested in April and May (Bokhari, Rasul, Ruane, Hoogenboom, & Ahmad, 2017). While wheat, chickpea, tobacco, rapeseed, barley, and mustard are Rabi crops, rice, sugarcane, cotton, maize, and millet are Kharif crops.

3.4.1. Tube well Cultivated Rabi Crops in Tehsil Mankera

The distribution of the tubular well-cultivated Rabi crops in Tehsil Mankera in 2020 is depicted in Figure 11. The findings indicated that wheat was the predominant crop since it occupied 63% of the irrigation area for tube wells. The second most common crop was gram, which covered 31% of the tube well irrigated area. The other Rabi crops were alfalfa (lusran grass), onion, and some other crops, which covered 2.5%, 1.5%, and 2% of the tube well irrigated area, respectively. The tube well irrigation is very challenging and expensive for the small-scale farmers in this area, as they have to pay high prices for petroleum oil to run the tube wells.

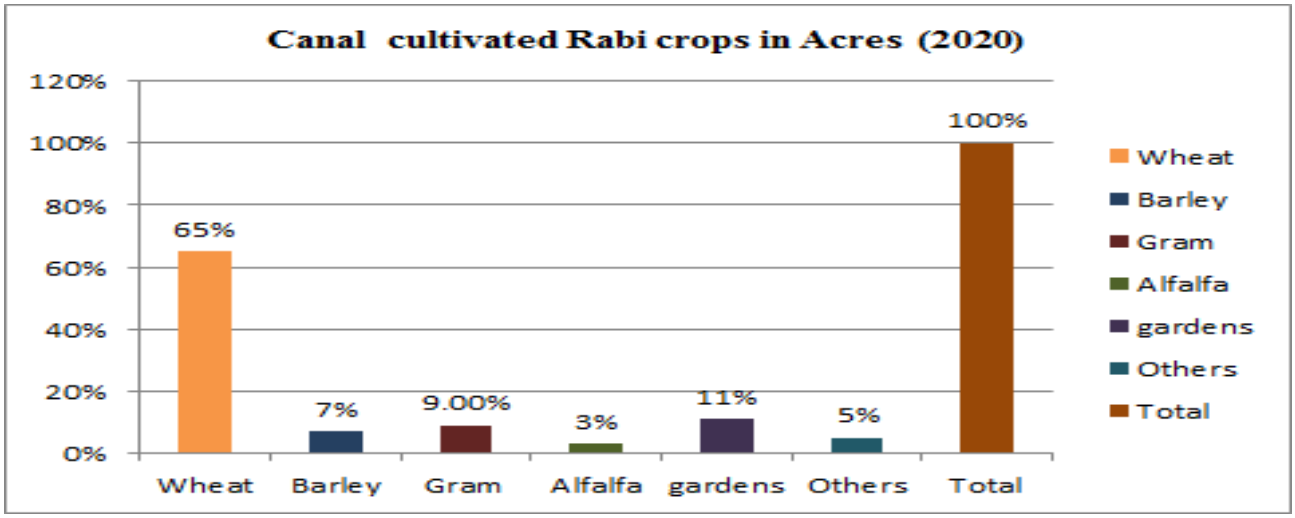
Figure 11: Tube well Cultivated Rabi Crops in Tehsil Mankera (2020)



3.4.2. Canal Cultivated Rabi Crops in Tehsil Mankera

Figure 12 shows the distribution of the canal cultivated Rabi crops in Tehsil Mankera in 2020. The results indicated that wheat was the main Rabi crop, as it occupied 65% of the canal irrigated area. The other Rabi crops were gardens, gram, barley, alfalfa (lusran grass), and some other crops, which occupied 11%, 9%, 7%, 3%, and 5% of the canal irrigated area, respectively. This area was more fertile than the rest of the Tehsil Mankera. Apart from wheat, the farmers also grew gardens, grasses, and other minor crops on this land.

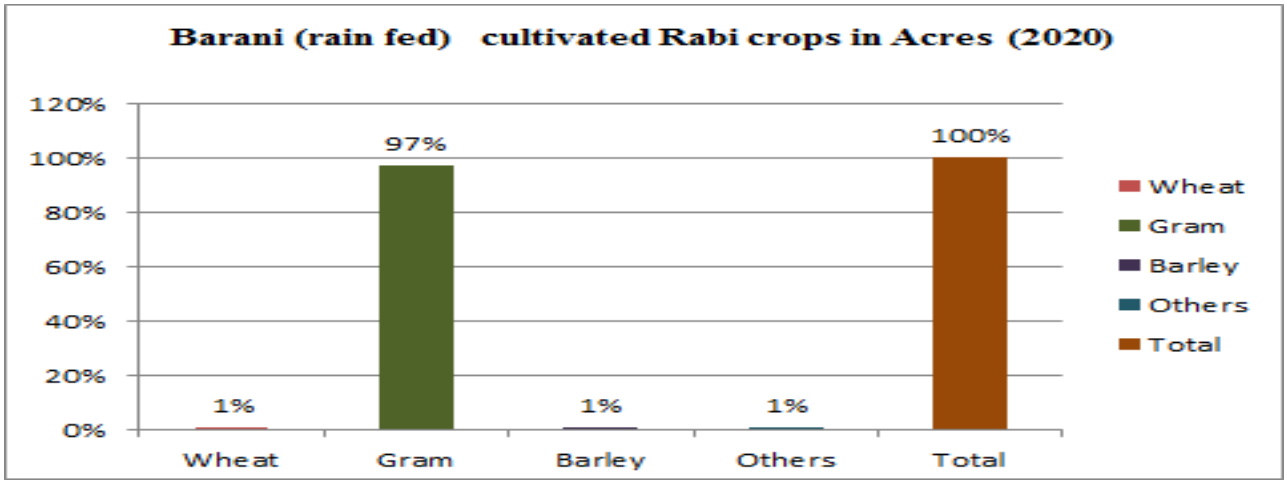
Figure 12: Canal Cultivated Rabi Crops in Tehsil Mankera (2020)



3.4.3. In Tehsil Mankera, Barani (rain-fed) Farmers Cultivated Rabi Crops

Figure 13 shows the distribution of the Barani (rain-fed) cultivated Rabi crops in Tehsil Mankera in 2020. The results showed that gram was the dominant Rabi crop, as it covered 97% of the rain-fed area. The other Rabi crops were wheat, barley, and some other crops, which covered 1%, 1%, and 1% of the rain-fed area, respectively. Tehsil Mankera is a desert area, where most of the land—79% of the land—is only suitable for Barani (rain-fed) agriculture due to the large dunes that cover the landscape. Gram is the main crop grown by rain-fed agriculture, which accounts for about 97% of the Rabi crop production in the mixed farming area of Tehsil Mankera. The farmers who depend on rain-fed agriculture are highly exposed to the risk of rainfall variability and droughts. However, when there is sufficient and consistent rainfall in the mixed farming area of Tehsil Mankera, rain-fed agriculture produces high yields and has low costs. The farmers in the study area benefit from such periods.

Figure 13: Barani (rain fed) crops grown for Rabi in the Tehsil of Mankera in 2020

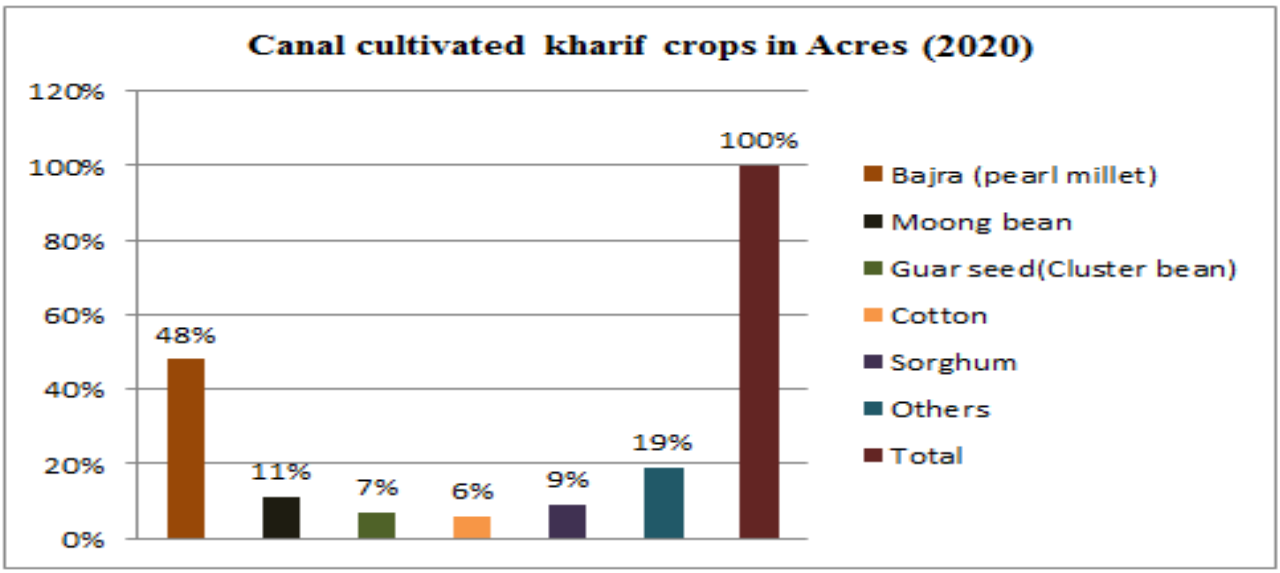


3.5. Canal cultivated Kharif Crops in Acres

Figure 14 shows the distribution of the canal cultivated Kharif crops in Tehsil Mankera in 2020. The results indicated that Bajra (pearl millet) was the main Kharif crop, as it occupied 48% of the canal irrigated area. The other Kharif crops were other crops, Moong bean, jawar (sorghum), Guar seed (cluster bean), and cotton, which occupied 19%, 11%, 9%, 7%, and 6%

of the canal irrigated area, respectively. Tehsil Mankera is a desert area, where only a small portion of the land—4% of the land—was irrigated by canal. The canal irrigation area was located on the west side of the Mankera, in the Union Council 67/ML. This area was more fertile than the rest of the Tehsil Mankera. Apart from Kharif crops, the farmers also grew gardens, grasses, and other minor crops on this land. There are two extremely effective strategies that can be used to reduce water scarcity. The first tactic entails improving the already-existing canal irrigation systems in the impacted areas. The goal of this optimisation process is to increase the effectiveness of water delivery and distribution, hence reducing water waste and maximising its utilisation.

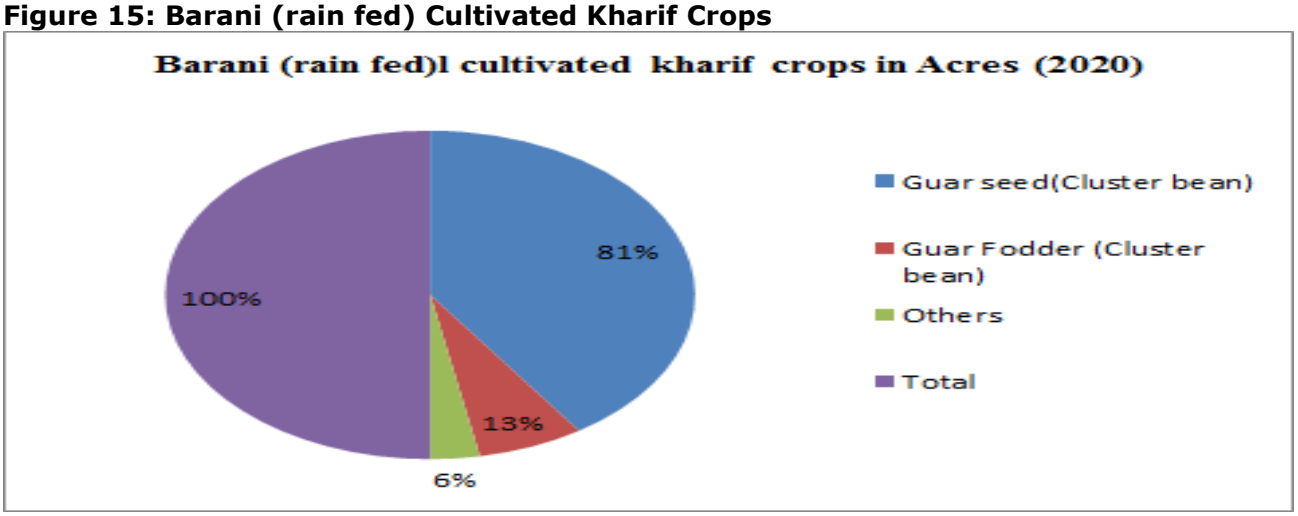
Figure 14: Canal Cultivated Kharif crops in Tehsil Mankera (2020)



3.5.1. Barani (Rain fed) Cultivated Kharif Crops in Tehsil Mankera

Tehsil Mankera is a desert region, and due to its dominant physical topography of enormous dunes, 79% of its land is only suitable for Barani (rain-fed) agriculture. The primary Kharif crop in Tehsil Mankera's diverse agricultural region was guar seed (cluster bean), grown in around 91% of the area using rainwater. As a result, they were entirely dependent on rain, and their crops were at risk of rain. Farmers relying on rain-fed agriculture are highly vulnerable to short- and long-term dry spells. If there is consistent rainfall in the diverse agricultural area of Tehsil Mankera, rain-fed agriculture produces large yields of crops, and the cost of agriculture is relatively low because of much rainfall. Farmers in the study area earn much from that time. Crop production in rain-fed environments is dependent on precipitation. About 17% of Pakistan's crop-growing area is used for rain-fed agriculture, essential to the country's economy. The Potohar and Baluchistan plateaus in Pakistan are rain-fed regions in various climate zones (extremely arid to very humid).

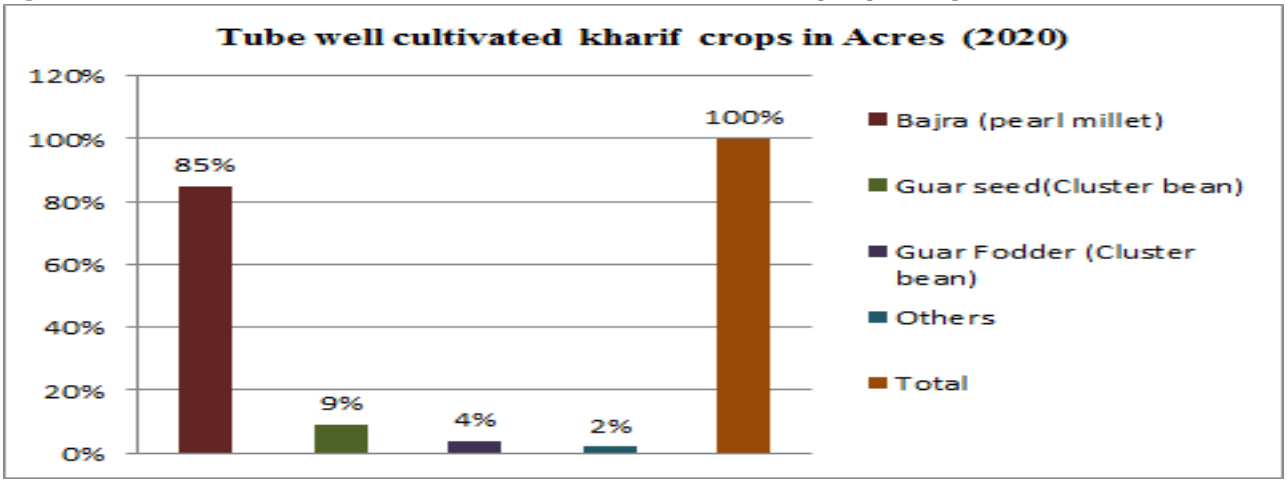
Figure 15: Barani (rain fed) Cultivated Kharif Crops



4.5.2. Tube Well-Cultivated Kharif Crops in Tehsil Mankera

According to the results, Bajra (pearl millet), which accounted for around 81% of all tube well irrigation's Kharif crops in 2018, was followed by Guar seed (13%), Guar fodder (4%), and just 1% of other crops. Tehsil Mankera is a desert region. However, there are a few small patches of low-lying ground next to the dunes where crops are grown with tubewell irrigation. In Tehsil Mankera, the area used for cultivating tube wells is about 17%. Bajra (pearl millet) and guar seed (cluster bean), which make up around 81% of the total and the remaining 13% of cultivation, are the two main Kharif crops in this region. The country's sharp rise in oil prices had a greater impact on tube well farming because the region's tiny farmers rely on tube well irrigation to provide fodder for their animals and cash crops like millet on small plots of land.

Figure 16: Tube wells were used to cultivate Kharif crops (2020)



5. Conclusion

The socioeconomic status of small-scale farmers in Tehsil Mankera District, Bhakkar, is a key focus of the research's foundation. This study examined mixed farming activities with the socioeconomic condition of farmer households and the services provided in the research area. The majority of farmers came from low socioeconomic origins and struggled with hunger and poverty. In the research region, 56% of farmer's household heads were under the age of 41–50 years, suggesting the existence of a joint family structure, which emphasises the numerous problems that a variety of climate, soil, and topographic factors produce in the mixed farming area of Tehsil Mankera. Approximately 67% of farmers' households had an illiterate head due to the absence of educational facilities. 86% of families have a joint family system according to the local custom. They (61.5%) have prominent family members comprising nine or more and in a joint family structure that rely on combining resources for survival. Due to a lack of education, there is a lack of knowledge of family planning techniques. Only 44% of farmers in mixed farming areas were familiar with family planning, and 80% of farmers' households have 1-2 earners. In addition, 42% of farmers' homes are unpaved, which indicates their poverty. Farming and rearing livestock is their primary income sources. Sound agricultural output significantly impacts the social development in a farmer's family, specifically on marriages and health issues. They have low output from farming. The steep slope of the dunes makes farming very difficult. The usage of modern farming technologies and their adverse impacts on the environment, change, and adaptation of agriculture techniques are less understood in families of old-traditional farmers.

Tehsil Mankera is a desert region; most land is used for rain-fed agriculture. Gram, the main rain-fed crop, was grown in about 79% of the area on uneven dunes because there is no other way to get irrigation without rain, making the farmers in this region more reliant on their crops. If there is regular rainfall in Tehsil Mankera's mixed farming area, rain-fed agriculture produces high yields and has a very low cost of production. Farmers in the study area have profit from that time. The area is low-lying land near a dune cleared and leveled by farmers using a tractor and is suitable for growing crops. The tube well irrigation was 17%. But with so many small farmers in this area and the sandy soil requiring more irrigation water as a result of the sharp rise in oil costs, the farmers are finding it increasingly challenging to employ this approach. Additionally, only 4% of Tehsil Mankera's land was used for canal farming irrigation. Moreover, about 88% of Tehsil Mankera was under cultivation. In the study area, wheat and Gram are the main rabi crops, while mustard, alfalfa and other grasses are also grown. Bajra (pearl millet),

guar (cluster bean), and jawar (sorghum) are the main kharif crops, along with other fodder crops. The farmers of Tehsil Mankera, a mixed farming area in the desert, depend largely on the livestock sector for their economic well-being. Their livelihood is mainly based on rain-fed agriculture, which makes their crops more susceptible to drought than their animals. Their income comes mostly from animal products such as meat, milk, butter, and yogurt.

In the mixed farming area, most farmers (80%) had access to electricity, but only a few (20%) had access to Market. About half of the farmers (40%) had paved road, while less than a quarter (22.5%) had Hospital. Even fewer farmers (17.5%) had Hospital for animals, and most farmers (70%) had primary school in the rain-fed area of Tehsil Mankera. The research results show that the farmer's household in this area faces many challenges or difficulties. These specific issues need early attention to improve their socioeconomic status when shifting from mixed farming to modern agricultural practices (mixed farming). Poverty needs to be reduced to provide employment opportunities to the poorer residents of the study area. Farmers in Tehsil Mankera may have better living conditions if they switch to a solar tube well system instead of an expensive tube well irrigation system. Dunes would need to be modified, rainwater would need to be stored, and water and wildlife would need to be conserved due to a change in temperature or climate.

References

Alderman, H., Behrman, J. R., Ross, D. R., & Sabot, R. (1996). The returns to endogenous human capital in Pakistan's rural wage labour market. *J Oxford Bulletin of Economics, 58*(1), 29-55. doi:https://doi.org/10.1111/j.1468-0084.1996.mp58001003.x

Bokhari, S., Rasul, G., Ruane, A., Hoogenboom, G., & Ahmad, A. J. P. J. o. M. (2017). The past and future changes in climate of the rice-wheat cropping zone in Punjab, Pakistan. *13*(26).

Deaton, A., & Paxson, C. (1998). Economies of scale, household size, and the demand for food. *J Journal of political economy, 106*(5), 897-930.

Devendra, C. (1997). Mixed farming and intensification of animal production systems in Asia. *J Outlook on Agriculture, 26*(4), 255-265. doi:https://doi.org/10.1177/003072709702600407

Herrero, M., Thornton, P. K., Notenbaert, A. M., Wood, S., Msangi, S., Freeman, H., . . . van de Steeg, J. (2010). Smart investments in sustainable food production: revisiting mixed crop-livestock systems. *J Science, 327*(5967), 822-825. doi:https://doi.org/10.1126/science.1183725

Ingram, K., Roncoli, M., & Kirshen, P. (2002). Opportunities and constraints for farmers of West Africa to use seasonal precipitation forecasts with Burkina Faso as a case study. *Agricultural systems, 74*(3), 331-349. doi:https://doi.org/10.1016/S0308-521X(02)00044-6

Khan, F. K., & Khisha, A. L. (1970). Shifting cultivation in East Pakistan. *Oriental Geographer, 14*(2), 22-43.

Monzote, F. R. F., Bello, R., Alvarez, A., Hernández, A., Lantinga, E. A., & van Keulen, H. (2012). Identifying agroecological mixed farming strategies for local conditions in San Antonio de Los Baños, Cuba. *International Journal of Agricultural Sustainability, 10*(3), 208-229. doi:https://doi.org/10.1080/14735903.2012.692955

Norman, D. W. (1995). *The farming systems approach to development and appropriate technology generation*: Food & Agriculture Org.

Powell, J., & Williams, T. O. (1995). An overview of mixed farming systems in sub-Saharan Africa.

Rockström, J., Karlberg, L., Wani, S. P., Barron, J., Hatibu, N., Oweis, T., . . . Qiang, Z. (2010). Managing water in rainfed agriculture—The need for a paradigm shift. *Agricultural Water Management, 97*(4), 543-550. doi:https://doi.org/10.1016/j.agwat.2009.09.009