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Effects of Population Pressure and Excessive Cultivation on Climate Change in District Dir (Lower) Khyber Pakhtunkhwa: Perception of Local Farming Community

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ABSTRACT
This study aimed at finding the association of population pressure effect on climate change (excessive cultivation). The study was conducted in seven tehsils and fourteen village councils of District (lower) Dir Khyber Pakhtunkhwa, Pakistan. A sample size of 346 respondents was selected through simple random sampling. Data was collected on a two level likert scale interview schedule. The association of study variables was tested by using chi-square test statistics. A highly significant (p=0.000) and positive (Tb=0.304) association between climate change and farmers possessing the technical ability to cultivate a variety of vegetables or multiple crops throughout the year. Similarly, a highly significant (P=0.000) and positive (T^b =0.316) association was found between farmer's practices to cultivate crops with organic instead of chemical fertilizer and climate change. Additionally, the result showed a highly (P=0.000) and positive (T^b =0.290) association between farmers believe in the usage of technology to increase high productivity with climate change. In addition, a highly significant (P=0.000) and positive (T^b =0.338) association was discovered between farmers experience increases the number of crops in seasonal year with climate change. Additionally, a highly significant (P=0.000) and positive (T^b =0.411) association was reflected from the relation between climate change and the new varieties of seeds drought resistant in the study region. Furthermore, a highly significant (P=0.000) and positive (T^b =0.253) association was inferred between climate change and farmers observed insecticide/ feticides resistance during farming.

Key Words: Population, Pressure, climate change and excessive cultivation

Introduction

Agriculture is a critical part of human survival, but it also has a significant impact on the environment and climate. Agriculture covers 40 percent portion of the earth's land and uses a significant 70 percent amount of consumptive water globally. Additionally, a large percentage of the global population is employed in farming and related industries. Climate change is already affecting agriculture, leading to crop failures, loss of biodiversity, and an increase in pests and diseases (McIntyre, B.D., 2009). Nitrous oxide is a greenhouse gas that is a relatively new threat to the environment. It occurs naturally, but its levels have increased significantly due to the increased use of synthetic fertilizers in agriculture. Direct emissions related to agriculture worldwide are estimated to make up 13.5 percent of all greenhouse gas emissions, and about 6 percent of U.S emissions. Agriculture is a major contributor to greenhouse gas emissions, and nitrous oxide is one of the key contributors from the agriculture sector (Menegat,Ledo,& Tirado,2022; Johnson, Myriah D., et al,2016). Agriculture not only contributes to greenhouse gas emissions through the use of fuel wood, but also through deforestation. According to the Food and Agriculture Organization (FAO), deforestation worldwide, mostly linked to the expansion of agricultural areas, is estimated to be responsible for 17.4 percent of greenhouse gas emissions. When land use changes are added to the emissions caused by agriculture activities, the sector's overall impact on climate change becomes much more significant (Cochrane, K.2009).

LITERTURE REIVEW

Agriculture plays a significant role in both the natural environment and human society. It is affected by changes in global environmental conditions such as climate change. However, excessive agriculture system highly contributes to greenhouse gas emissions, specifically methane and nitrous oxide, accounting for about 20% of such emissions (Rosenzweig and Hillel, 2000). Agricultural ecosystems varies widely, from highly intensive farming systems such as arable cropping systems in Western Europe, to low-input farming systems such as subsistence farming in sub-Saharan Africa. The intensive farming systems are associated with the highest emissions of greenhouse gases from agriculture, (Garnier, Josette, et al.2019, Tilahun, et al, 2023 Bennetzen, Smith, & Porter, 2016). While intensive farming systems are associated with the highest emissions of greenhouse gases, low-input farming systems, particularly those located in marginal areas, may be most severely affected by climate change. These systems are vulnerable to the negative impacts of climate change such as drought, extreme weather events, and soil erosion (Reilly and Schimmelpfennig, 1999; Kates, 2000). The overall driving force in agriculture is the increasing global demand for food and fiber. This is primarily driven by population growth, as well as shifts in dietary patterns, including increased consumption of meat. The growing population and their demand for food production, and wealthier population with a higher proportion of meat in their diets, are the main causes of the increasing demand for food and fiber (Evans, 1998). As a result of the increasing demand for food and fiber, agriculture exerts increasing pressure on land and water resources globally. This can lead to land degradation, including soil erosion, Stalinization, and pollution. The pressure on land and water resources from agriculture can have negative impacts on the environment and the sustainability of the agricultural systems (Kirchmann and Thorvaldsson, 2000). Climate change is expected to have different effects on agriculture in different parts of the world. The effects of climate change on agriculture are likely to vary depending on factors such as the specific geographical region, the types of crops grown, and the local agricultural practices. In some regions, climate change may lead to an increase in crop yields, while in other regions it may lead to decreased yields and other negative impacts on agriculture *(*Parry *et al.,* 1999*)*. The effects of climate change on agriculture depend on a variety of factors, including current climatic and soil conditions, the direction of change, and the availability of resources and infrastructure to adapt to change. There is a large variation across the European continent in climatic conditions, soils, land use, infrastructure, political and economic conditions (*Bouma et al., 1998;* Rabbinge and van Diepen, 2000). These differences across the European continent will also greatly influence the responsiveness of different regions to climate change. These regions with better resources and infrastructure will likely be more resilient to the effects of climate change, while regions with limited resources and infrastructure may be more vulnerable to the impacts of climate change on agriculture (Parry, 2000). Most of Europe has experienced increases in surface air temperature during the 20th century, with an average increase of 0.8 °C in annual mean temperature across the entire continent. This warming trend is expected to continue in the future, with potential consequences for agricultural production and natural ecosystems. (Beniston and Tol, 1998). According to results of GCM (General Circulation Model) simulations, large climatic changes are likely to occur over the European continent as a result of the likely increase in atmospheric concentrations of greenhouse gases caused by anthropogenic emissions. The results of an analysis of a number of GCM simulations indicate that annual temperatures over Europe will warm at a rate of between 0.1 and 0.4 °C per decade as per. This warming trend is expected to have significant impacts on agricultural production and natural ecosystems (Parry, 2000). Intensive farming systems in cool climates may benefit from a moderate increase in temperature, while systems located in hot and dry areas may be negatively impacted by climate change (Reilly and Schimmelpfennig, 1999; Darwin and Kennedy, 2000). The relationship between agriculture and climate change is complex. While the majority of greenhouse gas (GHG) emissions come from the burning of fossil fuels for energy, agriculture also plays a significant role. Agriculture has always resulted in some direct emissions, such as methane from animals and carbon dioxide from soils, but changes in animal feeding and land cultivation practices have led to an increase in these emissions (Stavi, & Lal, 2013).

MATERIALS AND METHODS

This study was conducted in seven tehsils namely Tehsil, Adenzai, Balamabat, Khall,LalQilla,Munda, Sumarbagh and Timergarain District Lower Dir, Khyber Pakhtunkhwa, Pakistan. Total population (House hold heads) of potential respondents came out to be 3222.For a population size of 3222 a sample size of 346 suffices as per criterion devised by Sekaran (2003). The study design was single-shot and data was collected through interview schedule covering both the variables. A conceptual framework was devised comprising of two study variables i.e. climate change (Dependent Variable) and excessive cultivation (Independent Variable). For the measurement of study variables, the attitudinal statements were pooled from the existing literature and two level Likert Scale was constituted for each study variable. The indexed dependent variable (climate change) was cross tabulated with

independent variable (excessive cultivation) to measure the association between study variables. Chi-square test was used to test the level of association between these variables at bi-variate Level.

$$\chi^2 = \sum_{i=1}^{c}\sum_{j=1}^{r}\frac{(O_{ij} - e_{ij})^2}{e_{ij}}$$

Table 1 Conceptual Framework

Independent variable	Dependent variable
Excessive cultivation	Climate Change

OBJECTIVES OF THE STUDY

1. To investiagte and analyse the perecptions of respondents concerning the role of population pressure ,as driving forces behind climate change.
2. To examining the perception of respondents regarding excessive cultivation as a drvining force for climate change .
3. To investigate the association between respondents perecptions of climate change and their views on excessive cultivation factors as driving forces for climate change.

RESULTS AND DISCUSSION:

Frequency and percentage distribution on the basis of excessive cultivation:

Reduction in size of land is the two challenges emerged in paradoxical pattern. Rising population has put pressure on the land and farmers produce more in order to meet the food requirements. The ordinary organic ways of production have been replaced by mechanical ways and means of agriculture. Moreover, the use of chemical fertilizer has also adopted and risen to maximum for the save of more production (Timsina, 2018; Jayne, & Headey, 2014). Although production has increased but as a result ecology has deteriorated with no notion of sustainability along with soil degradation and environment deterioration of environment. Almost 60% of rural Pakistan population is directly and indirectly involved in agriculture and depending on it as a profession. Pakistan economy is agrarian economy with GDP stands at 18.9%. It also engages 43% of the total workforce of Pakistan. Major activities on ground in agriculture is crop production, livestock and poultry management, and non- timber forestry. Furthermore, 90% of the total agriculture is based on irrigation. However, climate change is vulnerable affecting the seasonal patterns rainfall etc. Pakistan though has highly reliable and the most effective irrigation system in the world but still vulnerable to water stress. These surges in population putting pressure on water resources for extensive agriculture practices to produce more (Abid, Muhammad, *et al*, 2016; Ahmad, & Ekanayake, 2023; David *et al*., 2016).

The table no 1 divulged it inference from this survey conducted on a total sample size for the present study. The results showed that a significant majority of respondents agreed with certain statements. For instance, (67.1%) of participants agreed that the local community is engaged in agricultural practices while, (32.9 %) of the respondents disagreed. These findings indicated that agriculture is the main profession in the study area like other parts of the country. Agriculture was practiced and is contributing to the local economy at household level. Moreover, it could also be deduced that beside land cultivation, rising of livestock was also a part of their activities. These findings were in consommés to (Sekaran, *et al*., 2021; Shah, *et al*., 2021) that agriculture is a profession which includes not only cultivation on land but raising and rearing of animals as well. Pakistan leading population is residing in rural area means, the primary sources of income being agriculture with no exception in the study area (Kumar *et al*, 2015). However, mostly the farming community is facing the challenges of access to modern technology, water resources and favorable market to sell their commodities, cropping pattern diversification; storage facilities with exploring value added commodity many properties eradicate miseries of farmers. It is the most primitive profession with deep historical culture roots in the social system, which is also a hindrance in transforming it into a technologically viable profession in with application of modern know how as the farmers of land *(Miller, et al.2021*Rehman, et al. 2017).

Additionally, (58.1%) of the respondents also agreed with the statement cropping patterns in their area extended over multiple seasons. While, (41.9 %) of the participant disagreed. These findings were the emanated that all season agriculture practices prevailed. Farmers were used to crops cultivation of all seasons including summer and winter. However, these cropping are being under transformation due to climate change. These transfer maintains may include rain cycle changes, weather patterns and seasonal shift resulting in emerging hardships for the farming communities to negotiate either, due to unawareness and lack of finance to counter (Gorst, Dehlavi, & Groom,2018: Arshad, et al.2017; Abbas, & Mayo,2021). Moreover, alterations in temperature and precipitation result into change in cropping calendar either coming soon or in a lactated stage with unexpected cool and hot

mitigating the hopes of getting maximum production *(Khan,et al.2021;Nasir,& Alam,2018*;Serote,et al.2023 *;Mohsenipour,et, al.2018*).

Moreover, (54%) of the respondents confirmed their technical ability to cultivate vegetables or multiple crops throughout the year while (46 %) disagreed. These findings had similarities with the inference of (Ayaz, *et al*., 2019) that farmer apply agriculture practices year round spreading over various crops sowing and harvesting in different seasons. It could be attributed to the farmer's abilities and skill based on their indigenous learning putting to properly utilizing the seasonal demands in cropping patterns like rotation of crops greenhouse cultivation and selection of appropriate plants, more conducive to environment and high yield production (Kwambai*, et al., 2023*). Formal training being offered by government was available to the farmers to adopt new techniques in the quest of seasonal management, crops selection and how use to pesticide and obtain maximum results (Nyasimi, *et al*., 2017; Gruda, Bisbis, & Tanny,2019). Geographic location climate hard resources , specific crops ideal to the geography if properly identified, managed and practiced may help farmers earn more and living positive impacts on the environment with prevalence of sustainable practices as well (Gruda, 2019).

Furthermore, (50.7%) of the participants disagreed to the statement while (49.3%) of the participants believed in the possibility of cultivating crops using organic fertilizers rather than chemical ones. These findings divulged that chemical fertilizer use was on high scale although people do use to apply the locally produced farmyard in cultivating practices. It could be attributed to less availability of local farmyard manure application of chemical fertilizer help in achieving more production from fields. Some soil is not ideal for producing more through application of organic practices so farmers used to apply chemical fertilizer so more yield is produced (Ferdous, *et al.*2021; Seufert, & Foley, 2012). Organic farming often requires different infrastructure and equipment compared to conventional farming. It is almost transitional to switchover to organic farming from chemical due more time required for it. While farmers need immediate return from crops to run their routine life affair (Khadda, 2021; Piñeiro, et al.2020).

In addition, (50.6%) of the study participant expressed their agreement over using technology to enhance productivity while (49.4 %) of the respondents were negative viewed about the statement. It could be divulged from these findings the adoption of technology in agriculture, which is essential instrument in yield productivity was very low in the study area. It could either be due to unawareness and lack of necessary skill or being expensively. The results suggested some inclination of farmers toward new technology albeit it low adoption rate (Imran, *et al*., 2018). The probable causes of low production due to high cost related affair *(*Liu, Ye, *et al*., 2020). Moreover, costly energy being used in such mechanized equipment is another hindrance in adoption of latest know how on the field. Moreover, in certain cases these technologies not even environment friendly (Balafoutis, *et al*, 2017;Hemathilake, *et.al.* 2022*;*Clark, & Tilman,2017) and even loss of biodiversity and prevalent local ecosystem *(*Pulleman, *et al,*2022).

Furthermore, a considerable representation (56.1%) of the respondents reported an increase in the number of crops during the seasonal year moreover, (43.9%) negated it. These findings alluded toward the farmer's adjustability to seasonal fluctuation which applies on the field to produce more in every season. Although climate change has emerged with changing droughts, more rains (both unpredictable) however, the farmers have responded with adopting more viable strategies based on resilience to counter these conditions. Farmers had grown multiple cropping patterns in a single season to earn more (Katharina, *et al*., 2013) for this purpose more resilient varieties are chosen and applied on the field. It resists the unforeseen unfavorable condition like drought heat rise and getting mature in a short period of time. These practices have been identified as best choice to alter the food insecurity (Zougmoré, *et al.*2018; Tofu, & Wolka,2023;Kogo, Kumar, & Koech,2021).

Another significant finding was also revealed where, (50.6%) of the population supported a shift towards high-yielding seed crops in their region. It could be attributed to the prevalence of limited numbers of farmers having access to get high yield varieties while, a significant size i.e. (49.4%) denied access to these. The denial or inaccessibility of such number of farmers to improved variety seed is a big hurdle in achieving high production. The low productivity could also be contributed to non- adopting the required techniques necessary for smoothly maximum benefits (Sehrish, *et al*., 2022). Moreover, market dynamics do play it's dire role as and in accordance to the demand for various crops. Major obstacle in adopting high yield variety is due to the farmers own indigenous ways of influencing and communicating with each other through their indigenous social, economic and cultural means, which do not coincide to high yield production varieties (Raja, *et al*., 2022;Vitale& Vitale,2020;Bello, Baiyegunhi,& Danso-Abbeam,2021;Lamm *et al*., 2020).

Further, the data indicate that (63.3%) respondents acknowledged the importance of new drought-resistant seed varieties, while, (36.7 %) disagreed. It could be deduced from these inferences that people had the knowledge about the use and application of drought resistant varieties of agriculture in the study area. These varieties do contribute in production in even hostile environments, ideal for the rain fed areas, and even survive on huge amount of water (Khatun, *et al*., 2021). Drought is a major problem of the climate change phenomena, which has hit most of central Asia in general and Pakistan in particularly with special reference to rain fed areas. This

situation has put pressure on related agricultural system to produce more to meet the growing population demands. Although chemical fertilizers are termed to be more yielding but require more water and are also not suitable and unfriendly to the environment preservation. Climate change resultant factor is drought which is supposed to affect negatively one third of soil eating difficulties and normal plants to grow on sustainable ground (Patel,*et al.*, 2019;Kaushal,& Wani,2016;Ye, Heng, *et al.*, 2018;Rasheed,*et al.*, 2021;Patel, Priyanka,*et al.*, 2021).

While, regarding challenges, half of the (50.0%) of the respondents reported that pesticide and insecticide had resistance while, the remaining, (50.0%) opposed the resistance being observed. These inferences could be contributed to negative impact of wide use of pesticide wide spread. Farm productivity is usually enhanced by the application of fertilizer and insecticide and pesticide application. Although both had contributed to enhance in production but their frequent use has also been observed with resistance developed by insect at farm. Frequent use need to avoid by taking professional input, from the expert of the field. It has been a common dilemma that farmers are mostly unaware about the nature, timing and quantity of pesticide to be used at farm inconsistent and self-medicated approach by the farmers mostly emerged as counterproductive. Such frequent applications of pesticide have lost their fruitfulness and tend to diminish its utility over the passage of time thinking it to be more costly while less yield productive. Poor management practices regarding the use and application of pesticide render their benefits ineffective. It also leads to contamination of water and other destruction of useful biodiversity at farm. The pesticide pollutants contaminate the ground and ground water thus rendering it detrimental for the use of both animals and humans (Mengistie,Mol,& Oosterveer,2017;Asghar, Muhammad, *et al.*, 2013, Hashmi,2016;Shahid,*et al.*, 2016;Abbas,*et al.*, 2018;Sharma, Anket, *et al.*, 2019 , Marcelino,& Ghisi, 2019; Midega, Charles AO, *et al.*, 2016).

Additionally, (59.2%) of the participants agreed that it is crucial to protect crops and adapt to changing environmental conditions while, (40.8 %) respondents disagreed. These findings were align with close to these leading unearthed the farmer's capacity based on local knowledge know how adopting practice skill to protect the crops from an eventuality in any situational demand. These skills are indigenous based on their own life experienced being met with individual and community level in collective situations. These practices are owned and transmitted from generation to generation in order to mitigate the raising loses being increased due to these calamities (Irfan,*et al.*, 2018; Mfitumukiza, *et al.*, 2020; Doh,Tashman,& Benischke, ,2019*;Fahad,& Wang, 2018).* Over the ground methodology included the selection of varieties and there adaptation due to climate change condition and resistant natural disasters. These interventions are often community based and strategies are designed to encounter such natural disaster on collective plat forms. This collaborative strategy help them share the knowledge, organize and address the rising challenges in physical and financial terms under the doctrine of collective responsibility (Ali, Sajjad, *et al.,* 2017; Heeb, Jenner,& Cock, M. J. 2019).

Table No. 1 Frequency and percentage distribution of the respondents on the basis of excessive cultivation

S. No	Statements	Yes (%)	No (%)
1	The local community is engaged in agricultural practices	232(67.1%)	114(32.9%)
2	Cropping patterns in your area are spread over more than one season	201(58.1%)	145(41.9%)
3	You think that you have technical ability to cultivate vegetable or more crops during the year	187(54.0%)	159(46.0%)
4	You have possibility to cultivate crops with organic instead of chemical fertilizer	172(49.7%)	174(50.3%)
5	Do you believe in the usage of technology to increase high productivity	175(50.6%)	171(49.4%)
6	Have you experienced increase in number of crops in seasonal year?	194(56.1%)	152(43.9%)
7	Is farming shifting towards high yielding seed crops in your area?	171(49.4%)	175(50.6%)
8	Are the new varieties of seeds drought resistant?	219(63.3%)	127(36.7%)
9	Have you observed insecticide/ feticides resistance during farming?	173(50.0%)	173(50.0%)
10	You know how to protect crops and adopt to changing environment	205(59.2%)	141(40.8%)

4.4.2 Association between excessive cultivation and climate change

Pakistan as an agriculture country has a significant role in climate change dynamics like greenhouse gases emission from its forest and other land use activities by contributing 24% of the total anthropogenic emission (IPCC, 2014). Total GHG emission from the third world has risen to almost double in 50 years with agriculture as the major source. It has been concluded that livestock serve as the 2nd major contributor of GHG in Pakistan (FAO, 2014). The other services included barring residues (crops), rice cultivation, and manure management etc. with a soil degrading soil ratio of 16% to 40% of the agriculture land. Further, the water availability is also on decline for agriculture and stressful environment is emerging for water use in agriculture and human consumption which has led to surge in the food requirements to meet these required excessive land cultivation practices are adopted by adopting excessive use of fertilizers, machinery and water for irrigation. These excessive practices are owned beyond the land capacity and practiced without any sustainable approach to meet the growing feeding requirements. These practices entailed the transformation of land from agriculture to human dwelling due to raising demand and surge in human population. Moreover, the rising trend s in temperature, unpredictable weather patterns and delayed rainfall has also accelerated the aforementioned change which would lead to a huge pressure on sources of production and consumption. This paradigm is in no way supporting the co-existence of agricultural prevalence and unviable climate change (Ullah *et al.*, 2018; Chappell *et al.*, 201; Abid *et al.*, 2016).

The table no. 2 provides information that a significant (P=0.046) and positive (Tb =0.107) association was declared between climate change and local community is engaged in agricultural practices. These findings revealed that despite the emergence of climate change which represent variations in rainfall patterns, weathering and seasonal cycles, the locals were found stuck to their ancestral profession i.e. agriculture. Agriculture was the only major profession, the people are producing from their land to arrange food, money and negotiate other requirements for living an honorable life. It has been a major source of employment for both owners and cultivators in their filed. Moreover, livestock dependence is also associated with these lands. These findings have closed similarities with (Raza, et al, 2022) that Pakistani rural communities were comprehensively involved in agriculture related activities, which is the main source of rural economy by providing food and employment to a huge segment of population(almost 70%) in the rural areas. Moreover, the raw materials produce in these lands are also contributing to Pakistan national economy through export earning major crops cultivated are wheat, rice, maze, sugarcane beside fruits of different types with mangoes a leading fruit. Moreover, rearing and rising of livestock's do contribute significantly to local and national economy. However, it has been noticed that the emergence of climate change has badly affected the productions due to variations in the seasons, rainfall and weathering patterns. The local biodiversity and ecosystems were in dare situation by facing almost culmination due to the rising temperature and excessive cultivation for land to generate more revenue. Alteration in plantation with crop management could mitigate the negative effect of climate change and excessive cultivation through controlling the rate of deforestation and desertification of land (Khan, et al, 2022;*Shah,* Ateeq*, et al.2021;*IPCC, 2019*).*

Consistent with above a significant (P=0.042) and positive (Tb =0.110) association was found between climate change and cropping patterns are spread over more than one season. These line indicate that the impacts of climate change on the agricultural produce the farmers have been adopting new ways and means in the cultivating practices to order to acquire more reliance through are inputs practice on the fields. These strategies have been stressed due to the unpredictability in weather cycle, along with global warming's. The farmers had been adopting new strategies like in the cropping patterns with other new agricultural techniques to avoid the losses in production on the face of rising threat of climate change. These findings were in lines with the conclusions of *(Vanlauwe, et al.2015*) that farmers were frequent in adopting new seasonal cropping patterns, through better management resources like soil labor and water in an efficient manner to ensure an efficient and sustainable agriculture. Moreover, these efficient and sustainable strategies also help market demand meet with a consistent and predictable production round the years, which are beneficial for both communities and market. The adaptation strategies (cropping patterns) practiced by the farmers will enable farmer to increase production, mitigate the rise of unpredictability in weather, water and temperature through consistent supply to market to successfully help in reduction of food insecurity (Holzkämper, 2017 Paudel, 2016;Clay, & Zimmerer,2020).

Furthermore, the study has unveiled a highly significant (p=0.000) and positive (*Tb*=0.304) association between climate change and farmers possessing the technical ability to cultivate a variety of vegetables or multiple crops throughout the year. These findings revealed the relative importance of application for new technical know how to avoid the dare response climate change and to increase production as pre market demand. This situation has better rise to excessive cropping practices that has led to the emergence of land degradation. These findings indicated the increase in crop yields by mitigating the distress of climate change which has fostered the local economies. Farmers having advanced knowledge of applying the skills at their fields like irrigation practices crops selection with pest management have contributed to maximum yield and earning more *(*Ali, *et al.*, 2019; Aleminew, & Alemayehu, 2020*;* Harrison, Matthew,*et al.*, 2014;Schneider,& Asch, 2020).

Similarly, a highly significant (P=0.000) and positive (T^b =0.316) association was found between farmers practices to cultivate crops with organic instead of chemical fertilizer and climate change. These findings revealed the use of organic manure in the fields by the local farmers. The application of these methods could be attributed to its easy availability of cheaper and all-time availability being indigenous while chemical fertilizers are market based commodity, the farmers has to purchase it on cash, indicating the farmer's inability to purchase and apply it on their field. Moreover, the cost and benefit notion was not in support to the application of chemical fertilizer due to their souring priority. The practices of organic fertilizer were helpful in mitigating the new impaction environment being released by the chemical fertilizers. The organic manures ensure the prevalence of nutrient in the fields with lesser chances of runoff in the irrigation practices. These natural fertilizers are cost saving and deemed ideal for farmer's economy with ideal resilience to facing the variations in seasonal patterns and weather cycles by pushing the events to a more sustainable phenomena (Ye, Lin, *et al.*2020; Leavy, & Hossain,2014;Shaji,& Mathew,2021; Kumar, & Prakash, 2019;Islam, & Salim,2022).

Additionally, a highly (P=0.000) and positive (T^b =0.290) association between farmers believe in the usage of technology to increase high productivity with climate change. Technology, no doubt a primary tool in up taking land productivity was found favorable by the local farmers as well. These results indicate the fact that respondents have a deep insight into the returns associated with the application of technology in agriculture. These applications have yield positively in productivity with prosperity in the lives of *farmers.* Ahmad & Sharma, (2023) have also revealed the technology importance, it appropriate and timely application through a proper management usually mitigate the climate change related risks and has the potential to up take the land productivity by using advanced knowledge while eradicating the negative consequence while adding strength to local market through timely availability of produce on sustainable ground (Tepa-Yotto, *et al.*, 2022) adopting digital technology has led to laze leveling and precision in irrigation system have given much importance to growth and productivity at farm level (Javaid, *et al.*, 2022 ;Balafoutis, *et al.*, 2017;Clark, & Tilman, 2017;Hemathilake,& Gunathilake, 2022).

In addition, a highly significant (P=0.000) and positive (T^b =0.338) association was discovered between farmers experienced increase in number of crops in seasonal year with climate change. These results suggested the farmers opt of adapting to the changing environment variation in temperature. Moreover, the seasonal patterns and rainfall patterns of variations have completely changed the growing of crops as per old periodical table. The farmers have adopted the multiple cropping strategies in order to minimize the losses in cured due to loss of a single crop in case of any calamity. These multiple cropping has ensured the farmer earning in case any of the seasonal crops is vanished even this diversity has been proved successful in the variation seasons based temperature, waterfall and seasonal cycle unpredictability's. According to (Mustafa,& Massawe,2019) this diverse cropping is often adopted in leguminous which also contribute soil fertility by providing nutrient and carbon sequestration strength to combat the climate stress (Sharma, *et al*, 2018). This adoptability strategy of multi cropping pattern has empowered the farmers to properly handle the climate change stress as the stressor of one crop only affect the income of the farmers from the other which thrive (Sidle, *et al.*, 2023;Imran,& Ozcatalbas, 2021;Indoria, *et al.*, 2017).

Similarly, a significant (P=0.001) and positive (T^b =0.183) association was discovered between farming shifting towards high yielding seed crops in your area and climate change. These results revealed the dynamism on part of the farmers regarding the selection of crops being sworn. The farmers were found not being stuck to the old traditional mechanism of choosing the same crop adopted since long. Rather they have shift their timing and stunted owning of new varieties of seed with alteration in cropping pattern by owing of multiple cropping patterns this has enabled them to increase the productivity for more than all crop with in a stipulated time by using the same amount of water and fertilizer .These findings also suggested that farmers had high machination towards turned improved variety of seed to ensure maximum return. These results indicated to the fact that farmers had high degree of awareness and had righteously diversified their profession acme to negotiate the rising challenges in farming on successful grounds. Ploeg, (2017) had also supported these results that economic viabilities of farmers have considerably increased due to adopting improved variety of seed, establishing resilience against climate change by diversifying the crops and proper pest management imitative. Qaim (2020).contrary to the above, if proper awareness is not adopting farmers may not be able to get maximum benefits from improved varieties of seed, which could only possible to educating themselves almost their higher return and the inadvertent effects of climate change (Filoso,*et al*, 2015;Muzari, Gatsi, & Muvhunzi,2012;Shiferaw,*et al.*, 2011;Guttormsen & Roll,2014).

Additionally, a highly significant (P=0.000) and positive (T^b =0.411) association was reflected from the relation between climate change and the new varieties of seeds drought resistant in the study region. It could be inferred from these results that drought had hit the study area. They had suffered from its negative consequences and adopted strategies to cope with these challenging situation. Due of these strategies drought resistance usually introduced be the farmers to get maximum return from the farmers in case of non-availability of water.

Advanced biotechnology has succeeded in developing some drought resistant variety of seed which could survive in the water scarcity condition even being soured in the traditional manner. These hot and drought resistant variations are more ideal as reported in terms of production s reported by (Fahad, Shah, *et al.*, 2017) that Pakistan is facing water scarcity and drought oriented condition due to climate change and the development and application of drought resistant requires seeds that may help generate self-sufficiency in production. Moreover, it could also contribute to the rural economy and livelihood to thrive (Iqbal, *et al.*, 2022;Takahashi, *et al.*, 2016; Arif, G. M., *et al.*, 2019;Bardsley and Putz,2018). All these adopting strategies may help mitigate stress of negativity surfaced due to shortening of growing season particularly for wheat crop (Khan ,2018;Saif Ullah 2017;Munir, Zaffar, et al,2022).

Furthermore, a highly significant (P=0.000) and positive (T^b =0.253) association was inferred between climate change and farmers observed insecticide/ feticides resistance during farming. The latest and advanced agricultural practices has encouraged the application of new variety and improved variety of seed in order to receive maximum production. Moreover, the use of pesticide and insecticide has also been given a stunning role to protect these crops. However, it has been noticed that farmers were facing failure in control of pests even after the application of these pesticides. These failures could be attributed to the climate change implications emerging in the shape of rising temperature, droughts and unpredictability in seasonal patterns which has put at stake the production initiative from the land. FAO (2019) has also concluded that agriculture production changing initiatives must be safeguarded by containing soil desertification and erosion to meet the rising needs of food in Pakistan due to rising population. New research work to designed to develop new insecticide and pesticide by taking into account the temperature variation, rainfall data and seasonal period which would have positive effects on yielding practices(Khan,*et al.*, 2023) as going along with old practices have increased production costs and least yield producing phenomena (Hassan,*et al.*, 2021; Rehman, *et al.*, 2015; Durham,2021).

Lastly, a highly significant (P=0.000) and positive (T^b =0.352) association was found between climate change with how to protect crops and adapt to changing environment. These findings indicated that the farmer's agonies they suffered are due to climate change and there in abilities to adopt to the coping strategies to face their challenging environments. New varieties of crops with high degree of resistance need to be developed by taking stock of environmental variations, temperature and rainfall variation. Moreover, special workshop regarding awareness pertaining to their strategies is the only way forward to avoid the dare consequences as allocated by (Son, Chi, & Kingsbury.2019 and Anikwe, 2015). Time of irrigation, sowing and pest management techniques are highly effective in protecting the corps and receiving more production. Moreover, into cropping patterns and multi cropping patterns are new way of agriculture, which need to be propagated (Skinner & Kim, 2014; Jayasooriya,& Aheeyar,2016;Stephen, *et al.*,202; Saiz-Rubio, & Rovira-Más,2020).

Table 4.4.2 Association between excessive cultivation and climate change

S. No	Dependent variable	Independent variable	Statistics
1	The local community is engaged in agricultural practices	Climate change	$\chi2$=3.997 P=0.046 T^b =0.107
2	Cropping patterns in your area are spread over more than one season	Climate change	$\chi2$=4.149 P=0.042 T^b =0.110
3	You think that you have technical ability to cultivate vegetable or more crops during the year	Climate change	$\chi2$=31.910 P=0.000 T^b =0.304
4	You have possibility to cultivate crops with organic instead of chemical fertilizer	Climate change	$\chi2$=34.454 P=0.000 T^b =0.316
5	Do you believe in the usage of technology to increase high productivity	Climate change	$\chi2$=29.133 P=0.000 T^b =0.290
6	Have you experienced increase in number of crops in seasonal year?	Climate change	$\chi2$=39.603 P=0.000 T^b =0.338
7	Is farming shifting towards high yielding seed crops in your area?	Climate change	$\chi2$=11.552 P=0.001 T^b =0.183
8	Are the new varieties of seeds drought resistant?	Climate change	58.358 P=0.000 T^b =0.411
9	Have you observed insecticide/ feticides resistance during farming?		$\chi2$=22.101 P=0.000 T^b =0.253
10	You know how to protect crops and adopt to	Climate change	$\chi2$=42.877

	changing environment		P=0.000 T[b] =0.352

CONCLUSION

The study at hand was carried out in district (lower) Dir Khyber Pakhtunkhwa in order to uncap the reinforcing effects of excessive cultivation on the looming climate change adversities in the study area. The study proceeded with the major domains i.e. excessive cultivation on the climate change phenomena. Farmers with active involvement in farming as professions were taken as potential respondents for this study. Agricultural was the main profession and people used to practice both primitive and modern means of cultivation and harvesting along with application of chemical fertilizers in order to get more output from their farms in all available seasons by adjusting to adaptability in terms of crop protection management as well. Similarly, excessive agricultural activities i.e., producing more in a single season led to the frequent and uncontrolled use of chemical fertilizers and pesticides, which generated the existing dynamics while disturbing the prevalent mood of physical and social equilibrium emanating at the emergence of speedy climate change with negative consequences. Similarly, at the multivariate level, while controlling income of the respondents, the study revealed that all income groups i.e., low, medium and high intimated that increase in excessive cultivation had positively contributed to climate.

RECOMMEDATION

1. Adopt and promote sustainable agricultural practices to mitigate the adverse effects of excessive cultivation and climate change.
2. Providing farmers with timely and accurate weather forecasts and climate-related information to make informed farming decisions.
3. Focus on practical training in sustainable agricultural practices, climate adaptation techniques, and innovative farming technologies
4. Organize workshops and training sessions led by agricultural scholars, climate experts, and local agronomists

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