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Food Insecurity in the Western Himalaya: the Changing Pattern of Agro-Pastoral Activities and its Impact on Saif-Ul-Malook National Park, Pakistan

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ABSTRACT

This study explores the impact of poverty, and the changing pattern of agro-pastoral activities on Saif-ul-Malook National Park. For this purpose, data were collected from both primary and secondary sources. However, this study is mainly based on primary data. Primary data were collected from field survery through questionnaire survery, foucs group discussion and interview in August/September, 2018. A total number of 150 households were interviewed as a representative sample through random sampling technique. The collected data were analyzed through descriptive, inferential statistical techniques and cartographic methods. In order to check the econometric problems (i.e. heteroscedasticity and multicollinerity) in the assumption of ordinary least square (OLS) model, different diagnostics tests were employed and result of all the tests show the absence of any econometric problems in the model. The result of multi-regression shows that female-headed households of the study area are the 'poorest of the poor' and are more vulnerable and prone to poverty than men and face more barriers to lifting themselves out of poverty. This study indicates that agricultural transformation and cash crop cultivation have negative impact on poverty and improved food and livelihood security, ultimately improving the living standard of mountain people. Furthermore, it is inferred that the bio-physical environment of the Saif-ul-Malook national park is deteriorating and its sustainability calls for an immediate action to reduce the ever increasing human and livestock pressure on park resources.

Introduction

Mountain regions of the world are under severe threat of degradation and face multitude of global challenges such as climate change, hunger, malnutrition,

food insecurity, environmental degradation, water scarcity, desertification, loss of biodiversity, etc. (Ahmad et al., 2020; Ahmad et al., 2015; Sati, 2014; Galop et al., 2011; IUCN, 2018). According to Dach et al. (2013), 300 million mountain people are suffering from nutrition insecurity in mountain region. Additionally, one out of two people living in rural mountain region of developing countries is food insecure (FAO, 2011, 2019). These challenges disproportionally and more severely affect biodiversity and mountain ecosystem of developing countries. In order to in-Situ conservation of biodiversity and mountain ecosystem, national parks have been established in mountain milieu of the world. There are 6,555 national parks (NPs) worldwide (PWF, 2012) while mountain regions host one-third of world's protected terrestrial area (Yang et al., 2018). National Park, a natural World Heritage Site of global significance, is one of the most effective and globally recognized tool and measure for conservation and protection of the nature (Movcan, 1982; Byrcyn, 1992; Parsons, 2004; Parsons, 2004; Liesch, 2011; Mukherjee, 2011; Belay et al., 2014;). National parks are the protected place of natural beauty and are the home of many endemic species (Carruthers, 1994; Binnema & Niemi, 2006; Khan et al., 2011). It is considered as the greatest asset of ecotourism (Amalu et al., 2019; Rauf et al., 2019). Besides the importance's of national parks, there are also numerous inevitable socio-economic impacts of protected areas (Emerton, 2001; O'Riordan and Stoll-Kleeman, 2002; Igoe, 2006). The major adverse impacts are force displacement of population, loss of rights to use resource, landlessness, homelessness, economic marginalization, social disarticulation and food insecurity (Cernea, 1997, 2006; Brechin, Wilhusen, Fortwangler, & West, 2003; McElwee, 2006; Adams & Hutton, 2007).

Pakistan is a typical mountainous country (58%) and it is predominantly covered by Hindu Kush-Karakorum-Himalayan (HKH) range. It has a great variety of ecosystems which harbors globally important endangered species of flora and fauna. The HKH – the water tower of Asia – is source of 10 major river systems that provide the vital resources such as water, food, biodiversity and energy for a bulk of population of the lowland region. Additionally, it is also important for economy of the local inhabitants particularly for those people who are primarily depend on the agro-pastoral activities. The inhabitants of HKH heavily rely on the available natural resources for a varieties of purpose such as agriculture, livestock rearing, timber, hunting, fuel wood collection, etc. for subsistence survival and livelihood security. However, most areas of the HKH are under severe threat of environmental degradation due to population growth, unsustainable use and exploitation of natural resources. For conservation of biodiversity and mountain ecosystem, government of Pakistan has established many national parks in Hindu Kush-Karakorum-Himalayan region while neglecting the subsistence needs of local people (cf. Kharel, 1997; Cernea, 2006**;** Dittmann, 2000; Ahmad, 2019) and without providing alternative source of livelihood. Therefore, conflict between park authorities and local communities are usual and common in the HKH region generally and Saif-ul-Malook National Park (SMNP) particularly. Sometime, these conflicts become so severe that lead to loss of precious human live even and is one of the major thread to the peace, security and quality of the mountain life. Nevertheless, these uncertainties and turbulence not only pose severe challenges for integrated management of national Park but also results squarely failure of mountain national park project. Moreover, the potential benefits from the national park are unclear to the local communities on one hand while on the other hand, mistrust of the state's assurance is also obvious (Wallsten, 2003).

The livelihood strategies of the dwellers of western Himalaya primarily depend on agro-pastoral activities. Mountain agriculture and high pasturing are the mainstay of economy of the people of western Himalayas and a bulk of people are engaged in agricultural related activities for sustenance and these are the important components of livelihood security in mountain region. Since 1990, several visible changes have been occurred in various aspect of mountain agriculture, that are driven by a number of endo-genesis and exogenesis factors, including population growth, land tenure, improved in accessibility, market integration, and global environmental change. These changes have both positive and negative impact on livelihoods security and strategy of the local people due to mountain specificities (Jodha, 1992) such as including remoteness, inaccessibility, marginality and fragility in terms of moisture stress, poor soil conditions and a short growing season. Besides these, some inherent socio-economic constraints are smallholdings; poor productivity, production management, post-production management and marketing networks; labor shortages; and lack of entrepreneurship. Maintaining internal integrity in the face of such changing patterns and ensuring external connectivity to adjacent natural areas are critical another challenge and issues for park management. Moreover, the natural resource base of SMNP is deteriorating more rapidly than many other regions, but receives lesser attention than other regions and there is a dearth of in depth research on the sustainability of bio-physical environment of SMNP.

This study strives to explore and analyze the change and transformation of the livelihood strategies of inhabitants of Saif-ul-Malook National Park and its impact on SMNP. Additionally, it also highlight the impact of poverty on SNMP. Moreover, it also investigated the underlying causes of failure of SMNP to achieve its objectives. The findings can be applied as an input for policy formulation strategies for conservation of mountain ecosystem in SMNP and other mountain areas of the world. The mountain communities living in and around of SMNP have a long history and they are economically dependent on agro-pastoral resources of SMNP. Recently, tremendous change in the livelihood strategies have been witnessed resulting both positive and negative impacts on the livelihoods of the local inhabitants.

Literature Review

Food Insecurity

Since 2010, the prevalence of malnutrition and food insecurity are increasing and becoming problem worldwide (Rosegrant & Cline, 2003; FAO, 2021; Prosekova & Ivanova, 2018). According to GRFC (2022), 99 million peole in 2020 and 139 million people in 2021 were malnourished and hunger. Researchers around the world have identified serveal drivers of food and livelihood insecurity. However, the underling driving forces of hunger and malnutrition are climate change, desertification, extreme weather event, population growth, poverty, and armed conflicts (Gohar & Cashman, 2016; Ahmad, et al., 2021).

National Park

National Park is a natural space that is dedicated for the purposes of conservation, recreation, and protection (Belay et al., 2014). The international organization, IUCN (International Union for Conservation of Nature) and its World

Commission on protected Areas (PAs) have defined National Park as its Category II type of protected area.

Protected Area (PAs) play vital roles in protecting biodiversity and maintaining the ecosystem services. PAs are considered prominent tool for conservation biodiversity and maintainance of ecosystem worldwide (Butchart et al., 2010). In addition, PAs also provide a range of potential benefits including natural resources protection/conservation, economic development, national heritage, etc. (Correia et al., 2016 Kotru et al., 2020).

Currently, both number and area of PAs are increasing, covering about 15.4% of the world's terrestrial land area (Eklund & Cabeza, 2017). However, there is still problems of deliverance of conservation outcomes by PAs in terms of species and habitat protection. Consequently, there is a continuous decline in biodiversity (Butchart et al., 2010). There are many causes of failure of Pas and loss of biodiversity such as subsistence hunting, farming, lack of alternative source of income, conflict within and outside of Pas, lack fo effective management, etc. (Francoso et al., 2015).

Livelihood Strategy

Livelihood strategy is the combination of activities and choice undertaken by a household to provide a means of living. Sati et al. (2014, p. 9) have defined the livelihood strategies as 'increased well-being, reduced vulnerability, improved food security and more sustainable use of natural resources base'. However, during last three decades, several International Organizations (e.g. FAO, UNDP and DFID) and many other scholars have developed a frame works for sustainable livelihood (DFID, 1999; Ellis, 2000; FAO, 2005).

The livelihood framework of DFID is very popular and widely used. According to DFID (1999), the livelihood framework depends on five livelihood capitals such as natural capital, human capital, financial capital, physical capital and social capital. Moreover, vulnerability context – shocks, trends and seasonality; and institutional and policy context are the other aspects of livelihood strategies. Using available five capital, people of mountain region engage in diverse livelihood strategies to achieve livelihood goal.

According to Koczberski et al. (2001), the principal goal of livelihood strategy is to ensure food and social security. However, livelihood strategies of people vary from place to place which primarily depend on the availability of resources and opportunities. In relatively scarce resource base region particularly in mountain region, people adopt diversified livelihood strategies (Ellis, 1998; Abimbola & Obayelu, 2013) in order to avoid risk, vulnerability and seasonality.

Mountain Agriculture /Agro-pastoralism

The inhabitants of mountainous region heavily depend on agriculture. Agriculture in the mountainous region is referred to as 'arid mountain agriculture' (Staley, 1969), 'mixed mountain agriculture' (Rhoades & Thompson, 1975) and it is exclusively different from agricultural practices in the plain areas (Knight et al., 2014; Knapp, 2016). The same activity has dubbed as 'combined mountain agriculture' (Ehlers & Kreutzmann, 2000, 2020).

The silent traits of the mountain agriculture are quite similar throughout the mountainous regions of the world from Andes in South America, (Guillet,1986; Zimmerer, 1999) Alps in Europe (Bernues et al., 2015; Bernués et al., 2016) and Hindu-Kush-Karakorum-Himalaya (Tulachan, 2000, 2001; Kreutzmann, 2020; Ahmad, 2021) in South Asia. Whereby irrigated cultivation and animal husbandry are interdependent and integrated and extend over the different altitudinal belts and have a symbiotic relationship with one another (Ahmad, 2014., 2021). This economic system is known as 'vertical control' (Casimir & Rao, 1985) or 'verticality' (Guillet et al., 1986). It is also characterized by and associated with the movement of people and animals in vertical space, communal control of pastures combined with individual control of fields, and social institutions that schedule the intricate movements in space and time (Rhoades & Thompson, 1975; Ehlers, 2000, 2008; Ahmad et al., 2021).

Poverty and Multidimentional Poverty Index (MPI)

Poverty is an elusive term and is not self-defining concept. It is a complex and multidimensional phenomenon. There are several indices to measure poverty. These are headcount index, poverty gap index, squared poverty gap index, Sen index, Sen-Shorrocks-Thon Index, Watts Index, Human Development Index (HDI), Human Poverty Index (HPI) Gender-related Development Index (GDI), Multidimensional Poverty Index (MPI), Global Hanger Index etc. (SESRIC, 2015). Most of the indices are unidimensional i.e. income or consumption, etc. As regards, the HPI is a multi-dimensional index but it does not illustrate destitution suffered by households. However, the MPI is a versatile methodology and it identifies multiple deprivations at household level (cf. UNDP, 2019; Alkire & Santos, 2010).

MPI is a tool that integrate the wider concept of poverty by reflecting on deprivation with respect to health, education and standard of living. Until 2010, poverty was measured solely by taking account either income or consumption. However, the unidimensional indicator like consumption or income cannot capture the multi aspect of poverty. The Global multidimensional poverty index is a new international tool to measure acute poverty. It was developed by Alkire and Santons (2010, 2013) in collaboration with OPHI (Oxford Poverty and Human Development Initiative), University of Oxford and UNDP's human development report office (UNDP HDRO) in 2010.

The Alkire-Foster (A-F) method (2011) is used worldwide (GoP, n.d.; Wang et al., 2016) to measure poverty at individual level such as person or household against multiple criteria. It uses 10 indicators to measure three important dimensions of poverty at individual level such as education, health and living standard. It is a very flexible method and can be used with different dimensions and indicators to create measures specific to different societies and environments. For instance, it can be applied to measure poverty or wellbeing, target service, etc. Further, the MPI reflects both the incidence of multidimensional deprivation and intensity.

Materials and Methods

Study Area

This study is carried out on Saif-ul-Malook National Park (hereinafter referred to as SMNP), lies at a distance of 10 km from Naran Valley of District

Mansehra, Pakistan. The total area of SMNP is 12026 acres (Ahmad, 2019). Geographically, SMNP is located between 34° 52' 18" to 34° 52' 53" N latitudes and 73° 41' 24" to 73° 41' 54" E longitudes. It famous for its scenery and beautiful Saif-ul-Malook Lake throughout Pakistan.

The topography of study area is very rugged and it is surrounded by high mountain range of western Himalayas. Milika Parbat is the highest peak of this region and its elevation is 5000 meters above sea level. Due to rough topography and high elevation, there is no permanent settlement in this region. Since time immemorial, people of the surrounding area are utilizing Saif-ul-Malook lake and its surrounding areas as summer settlement for a variety of purpose such as farming, high pasturing, timber extraction, etc. However, it was declared as a National Park in April 2003, but local inhabitants heavenly rely on the available natural resources of Saif-ul-Malook national park. Currently, a bulk of population belonging to different districts of Pakistan (e.g. AJK, Chilas, Kohistan, Attock, Batagram, Abbottabad, Haripur, Toghar and Mansehra) migrate to Saif-ul-Malook National park during summer season for subsistence livelihood.

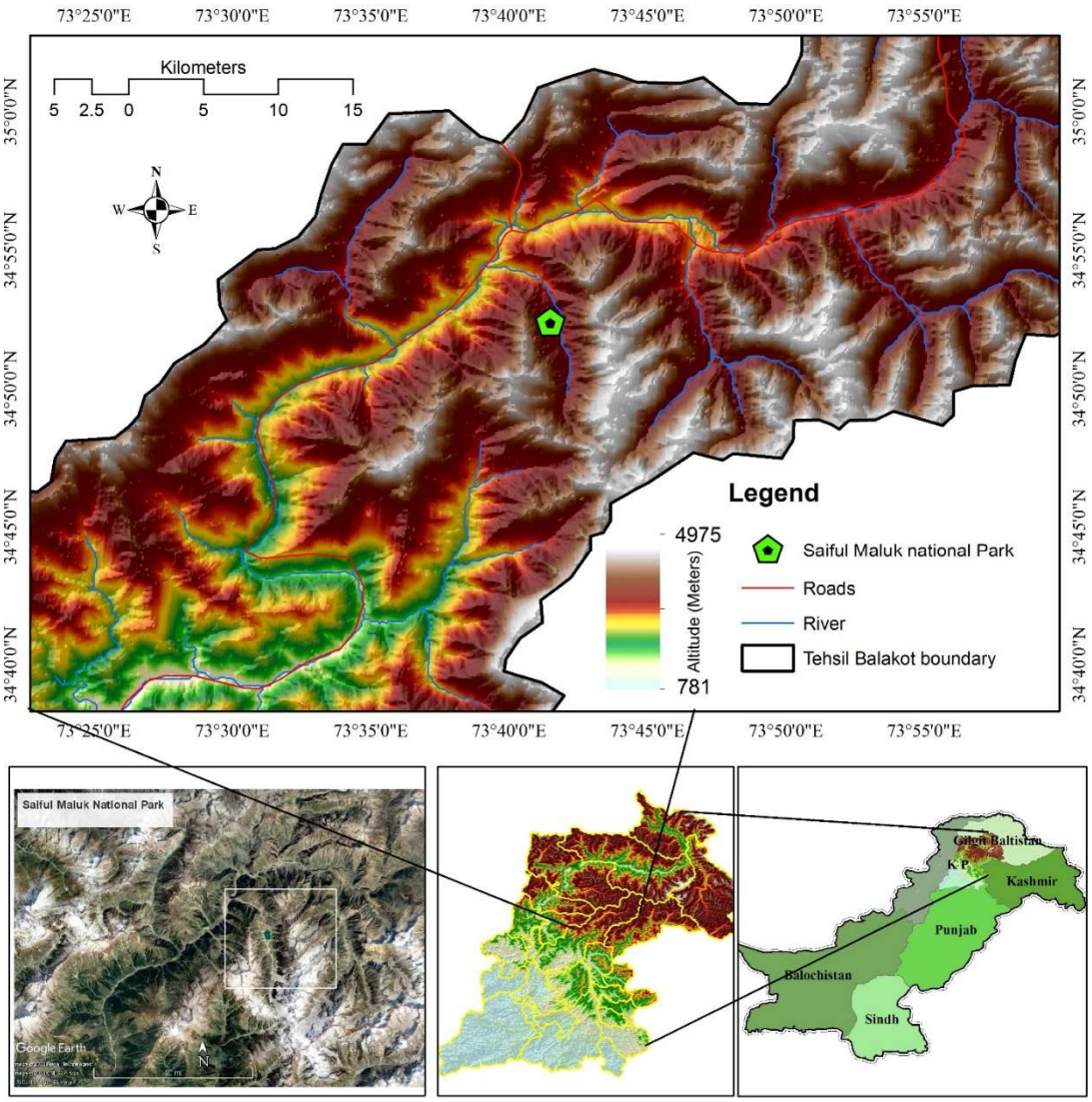

Fig 1: Location Map of Saif-ul-Malook National Park, KP, Pakistan

Population in SMNP is increasing at an explosive rate. Approximately, 250 households were living within the orbit of SMNP in 2018 along their livestock. Moreover, thousands of household are living in the surrounding area of SMNP. They are directly or indirectly are utilizing resources of SMNP. Apart from this, a huge number of national and international tourists also visit SMNP on daily basis and about 200000 tourists visit Saif-ul-Malook National Park per season resulting both positive and negative impacts (Ahmad, 2019). The SMNP is being utilized for various land use purpose such as agricultural, settlement, market, graveyard, pastureland. The existing ownership regime of the land resource of SMNP is still de-facto. The Syed, the ex-ruler family is the most influential and powerful ethnic group of the study area, claim that all types of land area (i.e. agricultural, pasture, range land and even forest area) right from Kaghan to Babusar top (including SMNP) are their private property. They collect huge taxes from the host communities.

Sampling and Data Collection

In order to achieve the objectives of this study, data were collected from both primary and secondary sources. However, this research is predominantly based on primary data. Primary data were collected from questionnaire survey while conducting an extensive fieldwork in the study area. Prior to field survey, an exploratory survey and pilot study was carried out in July/August 2017. The questionnaire was pre-tested with a group of farmers in study area. Following a minor change, a final survey was conducted in August/September, 2018. A total number of 150 households were interviewed as a representative sample through random sampling technique. The people of the study area practice an intricate seasonal movement. In order to understand, the complex seasonal movement mechanism, therefore, interview and focus group discussions (FGDs) were arranged in the study area (fig. 2 & 3) based on purposive sampling method. Two FGDs were conducted in the study area from the village elders. Data on household food situation were collected based on self-report by household heads. Moreover, photography, a best tool of primary data collection (Nüsser, 2001) is employed in this research in order to observe the present situation and show the current land use/cover of SMNP, pollution, overgrazing, etc. Necessary secondary data such as population data, etc. were explored from district census reports, article. Topographic sheet and SRTM data were used for creation of Map of the study area.

Fig. 2: SMNP: Focus Group Discussion

Fig 3: SMNP, Focus Group Discussion

Data Analysis

In order to proper analyze the collected data, different techniques such descriptive, inferential statistical and cartographic techniques were employed. In descriptive technique, socioeconomic data (age, household size, education, monthly income, land holding size, land fragmentation, house holing status and seasonal movement) were analyzed in the form of frequency, percentage, and graphs.

In order to check relationship between the socioeconomic variables and poverty, data were analyzed through a multi-regression using ordinary least square (OLS) method. For this purpose, first the poverty was calculated through using multi-dimensional poverty index poverty. Then it was taken as predicted variable while socio-economic variables such as cash crops, livestock population, age, income of male/female headed household, and agricultural land size were selected as explanatory variables for OLS model. Furthermore, prior to running the OLS in Eviews, the different type of livestock (sheep, goat, horse, cow, buffalo, donkey etc.) were converted into livestock unit by applying the conversion formula adopted by Fazlur-Rahman (2007; p.142).

Specification of Econometric Model

$$\text{Pov}=\alpha + \beta_1 \phi + \beta_2 \lambda + \beta_3 \omega + \beta_4 \text{þ} + \beta_5 \Omega + \beta_5 \psi + \mu \quad \ldots\ldots\ldots\ldots\ldots \quad \text{(i)}$$

Where;

Pov = Poverty measured by MPI α = Intercept ϕ = Cash Crops

λ = Livestock's population ω = Male Headed Household þ = Female Headed Household Ω = Income ψ = Dependency Ratio μ = Error Term
βi = Coefficient of independents variable

Econometric Problems and Statistical Tests

The multi-regression analysis need to justify different assumptions of OLS (Ordinary least square), in order to get reliable result and to avoid from misinterpretation of result. Therefore, different diagnostic tests were employed to detect the econometric problems in the estimated model.

Normality Test

The purposes of normality test is to know distribution of the variables in constructed model. As demonstrated in Figure 4, all the observations fall on the scatter line showing that data output is normally distributed.

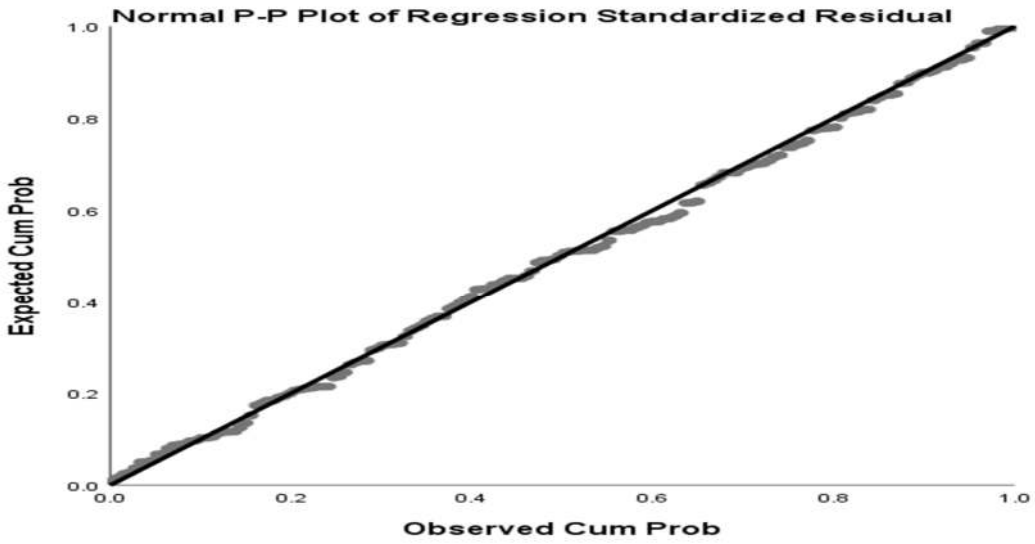

Fig. 4: Normality Test for Residuals

Test for Multicolliniarity

It is the existence of strong correlation among the explanatory variables. To check multicollinearity problem , VIF test was applied. The result in table portray that both Tolerance value and VIF value are within the limit and it is inferred that there is no issue of multicollinearity in the model.

Table 1
Multicollenearity Test

Variables	Tolerance Value	VIF Test
Intercept ©	0.948	2.44
Cash crop (ϕ)	0.463	3.89
Livestock (ƛψ)	0.864	2.99
Male HH (ω)	0.921	1.57
Female HH (þ)	0.754	4.38
Income (Ω)	0.875	4.68
Dependency Ratio	0.864	3.87

Results and Discussion

This study rendered both quantitative and qualitative results. These are;

Descriptive Analysis of Socio-economic Condition

Age is one of the most important parameter of socio-economic condition and it has a significant influence on the decision making process of farmers with respect to adaptation of modern technology, risk aversion, procurement/marketing of agricultural inputs and output. The analysis of age structure of the inhabitants reveals that majority of the respondent (58%) were active labor force, followed by aged people (36%) and only 6% were young. The result indicates that young people are seem to be somewhat less motivated to adopt the agricultural activities. The result

from educational attainment of the overall respondents' show that a bulk of respondents (68%) were illiterate. The literate categorized as primary, secondary, high secondary and higher education. About 18% of the respondent had primary level of education while 12% respondents had elementary and secondary level of education and only 2% of the respondent were graduated. Generally, educated person are more innovative, however, in the study area, majority of the farmers were illiterate. The result of table (2) portrays that majority respondents (58%) had large household size and 40% of the respondents had medium family and only 2% of the responded were small size. The average family size of the study area is 8.73 with standard deviation of 2.19. The result shows that household size of the study area is very large as compared to national average. Every household of the study area keep livestock. According to table (2), 60% respondents had medium livestock population size (11-50), 26% respondents kept large livestock size (>50) and only 14% had small livestock population (<10) with a standard deviation of 19.7. The result indicates that size of livestock is profoundly vary from household to household and the threshold livestock size of the study area is 4 while maximum livestock size is 300 (Table 2).

The inhabitants of the study area are engaged in diverse livelihood strategies. However, majority of the respondents were employed in primary economic activates such on-farm activities, high pasturing, etc. According to the table (2), majority of the respondents (44%) were engaged in cultivation of crops including both agricultural crop (wheat, maize, etc.) and off-season vegetables (pea and potato) and 24% respondents were herder. The finding reveals that source of off-farm activities are meager in the study area and therefore majority of the respondents are predominantly dependent on agro-pastoral activities. Monthly income is the best yardstick to identify and determine the life standard of the people. According to table (2), mean monthly income of the household vary from household to household. The mean monthly income shows that the income of majority of the respondents (60%) fall in the income range of 10000-30000 per month. Similarly, the analysis show that few respondents (12%) had high monthly income level (>30000).

The landholding range shows that most of the respondents (56%) had small size (<10 Kannal) and 34% household has agricultural land falling in the range of 11-30 Kannal. Only 10% respondents had large size of agricultural land (>30 Kannal). However, the average landholding size was 12. 32 Kannal. Table (2) displays that fragmented land and multi-house holdings are the major characteristic of people of the study area. The result shows that 84% respondents had fragmented land in two different altitudinal zones while 16% people had fragmented land in two different altitudinal niche. In order to sustainable utilization and management of land and other associated resources, people have constructed home at different altitudinal zones.

Table 2
SMNP: Socio-economic Characteristics of Respondents, 2018

Variables	Characteristics	F	%	μ	SD	Min	Max
Age (Yrs.)	Young (<30)	9	6	54.92	16.50	26	82
	Adult (30-60)	87	58				
	Aged (>60)	54	36				
	Illiterate (0)	102	68				
	Primary (1-5)	27	18				

Edu. Level	Elemt. & Sec (6-10)	12	8	8.32	12.3	0.0	16
	Higher Sec(11-12)	6	4				
	Higher Edu (>12)	3	2				
	Small (<5)	3	2				
	Medium (5-8)	60	40	8.73	2.19	4	17
Household Size	Large (>8)	87	58				
	Small (<10)	84	56				
Landholding Size	Medium (10-30)	51	34	14.32	12.73	3	60
	Large (>30)	15	10				
	One	0	0				
Land Fragmentation	Two	126	84	16.67	31.54	1	3
	Three	24	16				
	Small Size (<10)	21	14				
Livestock Population	Medium Size (11-50)	90	60	32.33	19.73	4	300
	Large Size (>50)	39	26				
No. of Houses	One	0	0				
	Two	90	60	16.67	31.54	1	3
	Three	60	40				
	Farmer	66	44				
Occupation	Herder	36	24				
	Tourist Guide	3	2				
	Driver	6	4	6.25	6.83	1	22
	Cook	9	6				
	Boatman	6	4				
	Horse rider	6	4				
	Others	18	12				
Household Income (000' Rs.)	Low ((<10)	42	28				
	Medium (10-30)	90	60	18	10	8	60
	High (>30)	18	12				

Source: Field Survey, 2018

Seasonal Movement- A Creative Adjustment Mechanism

The study area offers different altitudinal niches where resources are distributed vertically with varying resource potential (fig. 5). In order to properly utilization of agro-pastoral resources, the local inhabitants are practicing an intricate seasonal movement between 600m-3600m above mean sea level from the last many centuries. According to fig. (5) people dwell in the winter settlements (<1500m) from November-April and summer field settlements (1501-2500m) from April to October. In summer settlement, people cultivate different type of agricultural crops (potato, pea, etc.). According to fig (5) cultivation of crop starts in the beginning of April. Therefore, people from the surrounding areas (Hazara, Mansehra, Kohistan, etc.) move to summer field settlement for cultivation of off-season cash crop (fig. 6). According to table (3), 82% people have double-houses while 18% respondents own triple-houses in different altitudinal zones. The third houses of the people are located in a high altitude between 2500-3600m above mean sea level. This zone is being utilized exclusively for high pasturing purpose.

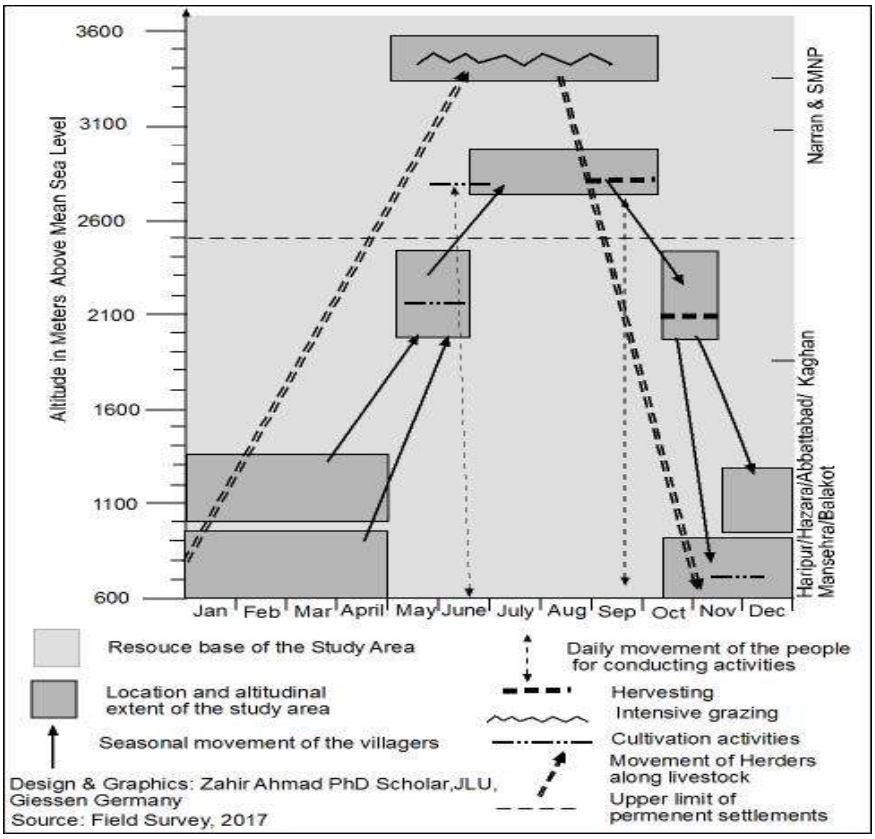

Fig. 5: SMNP: Seasonal Movement Mechanism

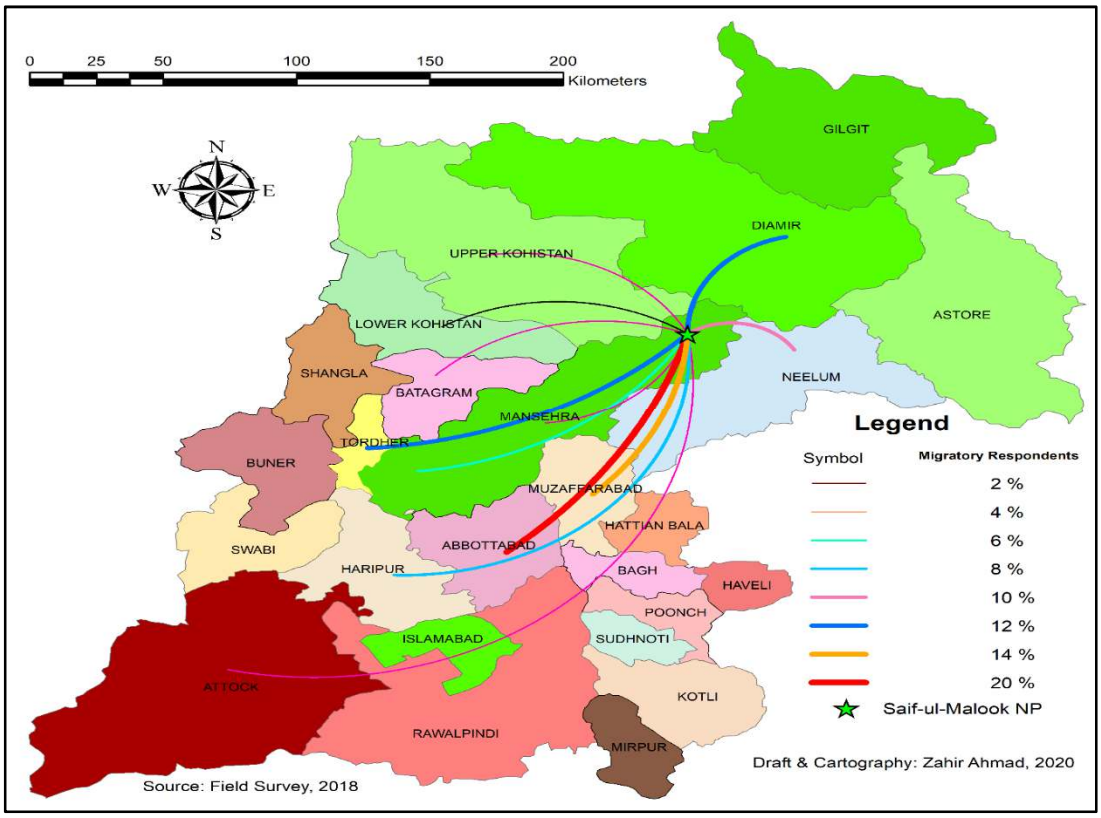

Fig 6: Seasonal Movement of Peasants from surrounding Districts to SMNP

They get different resources from different niches such as grain from winter villages. Potato, pea, and fodder from summer villages. The main factors of seasonal movement are seasonal productivity of land resources (both agricultural land and pasture land), multiple house ownership, pleasant weather, explosive bill of electricity and seasonal job opportunities in SMNP. Based on these varying resources potential, the inhabitants of the study area have established their own specific agro-pastoral system to manage and utilize geographically segregated and seasonally productive resources (Ehlers 1997; Ahmad, et al. 2021) which present adaptive responses to the high altitude condition of the study area (Ehlers, 1997; Fischer, 2000). For effective utilization and proper management of these resources mountain inhabitants have developed an intricate system of seasonal movement. The inhabitants of the study area predominantly rely on integrating spatially segregated and seasonally productive resources for livelihood security.

Regression Analysis

Multi-regression was carried out to determine the impact of explanatory variables on predicted variable i.e. poverty. The value of R-squared is 0.82 which indicates that 82% fluctuation in dependent variable are jointly determined by explanatory variables. The F-statistic and corresponding P-value (0.000) show that F-statistic is significant. The interpretation of F-statistic, P-value and value of coefficients show that the OLS model is nicely fitted and the overall results of regression model is reliable. The independent variables cash crop, livestock population, male headed household and income have negative implication on poverty. The result of multi regression shows that female-headed households and dependency ratio have positive relationship with poverty. It is inferred that female headed household of the study area are more vulnerable and prone to poverty than male-headed household and face more barriers to lifting themselves out of poverty (table 3).

Table 3
Saif-ul-Malook National Park: The Impact of Socio-Economic Variables on Poverty

Variable	Coefficient	St. Error	t-value
Intercept ©	9.378	0.135	69.48
Cash crop (ϕ)	0.124	0.082	1.52
Livestock (ƛψ)	0.064	0.023	0.27
Male HH (ω)	0.250	0.085	2.94
Female HH (þ)	0.895	0.135	6.63
Income (Ω)	0.138	0.099	1.388
Dependency Ratio	0.985	0.125	7.88

R-square =.82 F. Statistic = 78.4 Dependent Variable = Poverty measured by MPI

Impact and Current Situation of SMNP

Like other mountain region, the inhabitants of SMNP and its surrounding area are engaged in diverse economic activities which have both positive and negative impacts.

Job Oppertunities for the Local People

SMNP and its surrounding area have a great potentail for tourism. Tourists, both national and international visit the SMNP in summer season every year. Many new source of livelihhods have been created for the local people. These include driver, tourist guide, story taller, cook,boatman, horseman and horse riding. Local people get a lot of benefit from these job oppertunities. According to an interview from a driver, during tourist season (June to October) every driver collect sufficient money for the whole year. According to table (2), 32% people are engaged and dependent in tourism related economic activities.

Expoitation of Natural Resources

Local people living in and around SMNP are utilizing the natural resources of SMNP for subsistance sustance. Livestock are grazed intensevely in the green pasture of SMNP. They exploit the natural vegitation and cut down the forest for construction of house, heating and cooking purposes. They also cultivate different type of off-season cash crop in the core area of SMNP. The fragile moutanin topography is erroding due to over grazing, deforestation and agricultural activities. Flora of the national park is decreasing ,soil is erroding, forest is degrading, and water is polluting. Morever, due to these anthropogenic factors the beatuful valley is suffering from flooding as well. Simply environmental degration is giong on at very rapid pace in SMNP.

Enchroachment on Govt Property

People have ellicitly enchroached on the govt property. According to 1973 constitution of Pakistan, all the forest, rangeland, barren land and mineral are state property. However syed, the most influential ethinc group of the study area, have control and commond on the land resource. They claim that the whole area are their private/communal property. They are utilizing land area of SMNP for a varities of purpose such as agricultural land (fig. 7 & 8), construction of houses, shopes, hotels, market (fig, 9 & 10) and even for graveyard (fig. 11-13). Constrution works are going on in core area of national park area at an alaraming rate. According to focus group discussion, people are living in the core area of SMNP in the form of colony in small hamlets. There are twenty small neighbourhoods/hamlets which comprised of approximaelty 200 houses in the orbit of SMNP. There are about 80-100 shopes in core zone of SMNP (Ahmad, 2019). Besides these, people also utilizing the core region of Saif-ul-Malook National Park as graveyard and considerable plain area of SMNP has been converted into graveyard.

Pollution (Soil, Air and Water)

Population in the Saif-ul-Malook National park is increasing at an alaraming rate. A part from hotelier, shopkeeper, families of herders and farmer (seasonal migrants) , a bulk of population in the form of tourists are visiting SMNP on daily basis. According to Shah et al., (2013), 200000 tourists visit Saif-ul-Malook National Park per season which are more than the carrying capacity of SMNP. Moreover, the population is increasing every years resulting negative impact on the hydralogy, soil, air, etc. Water is polluting, soil is erroding by construction of building, agricultural activities; the air is polluting by vehicals and environment is polluting by garbages

(fig. 14-17). Nothing is save even equatic life of River Kunhar is endenger due anthropogenic activities in the SMNP. The waste water of washroom of hotels and restourents were directly fed to the main stream of river Kunhar. In this way, water of River Kunhar is polluting and continimating seriously. Therfore, not only the equatic life is endenger but also the human life of down districts are vulnerable because the people living in the catachment area of Kunar River directly use the water for drinking, cooking and washing purpose.

Loss to Physical and Cultural Resources

Physical resources like flora and fauna is decreasing day by day due to grazing and hunting. Fertility of soil is also degrading due to tillage of soil and use of chemical fertilizers, pesticides etc. People exploit the natural resource for their benefits. However, people living in SMNP also are also destroying cultural resources like sign board, litterbin, etc. without any proper justification.

Fig. 7-8: A pictographic view of cultivation of potatoes in the core area of SMNP

Fig 9-10: A pictographic view of settlements and market in the core region of SMNP

Fig. 11-12: A pictographic view of graveyard/market in the core region of SMNP

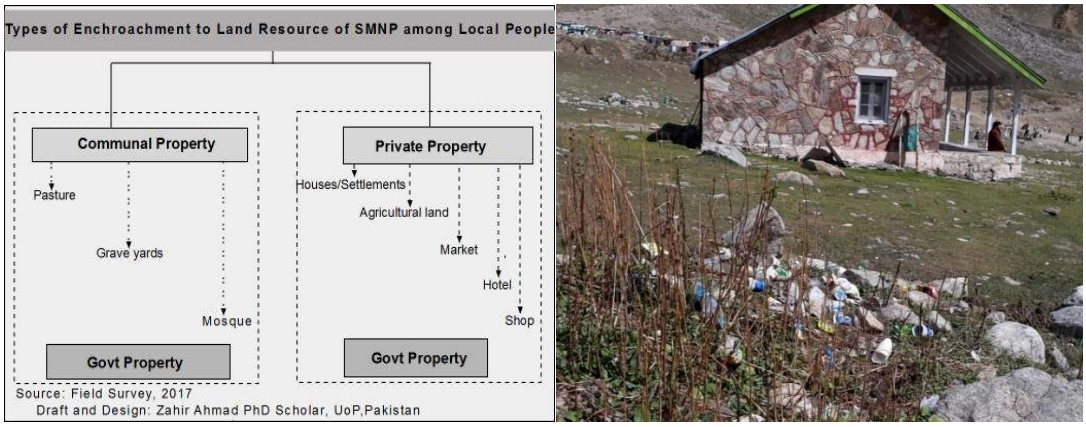

Fig 13: Type of Enchroachment on Land Resource of SMNP

Plate 14-16: Pollution around Saif-ul-Malook Lake

Fig. 17-18: A View of Pollution near Market area of SMNP

Discussion

Similar to other rural mountain communities of world (Fang et al., 2014; Khatiwada et al., 2017; Ahmad et al., 2021) the people of the study area combine diverse set of on-farm and off-farm income generating activities and construct a portfolio of livelihood activities as a viable economic strategy for livelihood sustenance and to avoid risk, maximize self-sufficiency and mainmize seasonality. The livelihood strategies of the mountain inhabitants are highly dynamic and new services are adding in the domain of the livelihood strategies especially after establishment of national park. The main components of livelihood include farming, livestock rearing, wage labor, government and private services, business, tourist guide etc. However, agro-pastoral activities are still the main economic activities of the people residing in and around Saif-ul-Malook National Parks. Agriculture is the dominant sector of livelihood and it alone engaged 44% of the local people. High pasturing is the second important sector of the economy after farming and 24% respondents were herder. The result indicates that majority of the respondents (66%) are directly dependent on agro-pastoral activities because majority people are uneducated (table 2) and source of off-farm activities are meager as well. The result also indicates that size of livestock is profoundly vary from household to household.

It is observed that currently an intensive grazing and farming are being carried out in SMNP beyond the carrying capacity of SMNP. This is mainly because of conflict between park authorities and local communities. According to focus group discussion, the so-called park authorities were taken an operation to remove/force displacement of the local people from national park without proving alternative source of livelihoods, shelter, etc. to the local people, at nighttime in July 2017. As a result of this illegal action, unfortunately, an innocent poor man (had five children under 14 year age) was murdered by firing from the national park authorities. In response of this inhuman act, the local communities had provoked and were seriously exploiting the resources of SMNP.

Similar to Karakorum mountain region (Kreutzmann, 2006; Nüsser et al., 2012; Uhlig & Kreutzmann, 1995), agriculture in the study area is passing through a state of visible transition and change. The indigenous crops cultivation has lose it

importance due to low productivity and alarming population growth. Currently, two new cash crops (off-season for the market) such as potato and plea have been introduced and experimented in the study area. In the initial stage, this change and innovation have become highly successful. Due to this innovation and transformation, the traditional interrelationship between crop farming and animal husbandry is somehow weekend in the study area. However, the agriculture is still confronted with many constraints and challenges such as high cost of inputs (pesticide, seed, etc.), small land holding size, land fragmentation, huge taxes, unpredictable severe climatic condition, remoteness from market, etc.

The study area is being used as a summer settlement and verticality is the principal feature of the study area and offers different altitudinal niches with varying resource potential. In order to properly utilization of the spatially segregated and seasonally productive resources (Ehlers, 1997; Fischer, 2000), people from the surrounding areas (i.e. Hazara, Mansehra Kohistan, AJK, etc.) migrate to SMNP and its surrounding area for cultivation of off-season cash crop and high pasturing. The main factors of seasonal movement are seasonal availability of land resources (both agricultural land and pastureland), pleasant weather, fooder availability for livestock, and explosive bill of electricity in winter settlement.

Contrary to other mountain region (Bhole, 1998), the result of multiple regression revealed that innovation in agriculture (cash crop), livestock population, male headed household and income have negative implication on poverty. Female-headed households and dependency ratio have positive relationship with poverty. It is inferred that female headed household of the study area are more vulnerable and prone to poverty than male-headed household and face more barriers to lifting themselves out of poverty. The result indicates that female-headed households of the study area is 'poorest of the poor'(cf. Chant, 2007). In contrast to other national park, the core area of SMNP was used for a variety of purposes such as farming, market, pasturing, and constructional work is going on within the boundary of SMNP. Similar to the finding of Byrcyn (1992), pollution is one of the major problem of SMNP. Nothing is save in and around SMNP, air is being polluting, water is degrading, and even aquatic live is at the stake.

Concluion

Agro-pastoralism are lynchpin of the economy of people living in and around SMNP. Thousands of people are predominantly dependent on mountain agriculture system and other resource of SMNP for their subsistence survival, food and livelihood security. The study area presents different altitudinal belts with varying resource potential. Based on these resources, inhabitants of the study area have established their own specific agro-pastoral system to manage and utilize integrating geographically separated and seasonally productive resources which present adaptive responses to the high altitude condition of the study area (cf. Ehlers, 1996; 1997; Ahmad, 2021; Ahmad et al., 2021). In order to proper utilization of agro-pastoral resources, local inhabitants are practicing an intricate seasonal movement. Generally, people dwell in SMNP during summer season from May to October and in winter village from November to April. They get different resources from different niches such as grain from winter villages and off-season vegetables such as potato, pea, etc. from alpine villages.

This study indicate that agricultural transformation and innovation have negative link with poverty. As a result of agricultural innovation, food security, livelihood have been improved. Furthrmore, employment opportunities amd living standard of the mountain people has been enhanced. The findings of this study indicate that female-headed households of the study area are the 'poorest of the poor' and are more vulnerable and prone to poverty than men and face more barriers to lifting themselves out of poverty. However, these innovation and changes have negative implication on SMNP. Currently, SMNP has failed to achieve its objectives. The findings indicate that the bio-physical environment of SMNP is deteriorating at an alarming rate and its sustainability calls for an immediate action to reduce the ever increasing human and livestock pressure on park resources.

Recommendations

- It is strongly recommended that alternative source livelihood and shelter should be provided to the local people.
- The study area possess a great potential for ecotourism that should be developed sustainably.
- Seminars/conferences should be arranged to create awareness among the publics.
- Training should be given to park staffs especially for the SMNP staffs for enhancement of problem solving skill and knowledge.

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