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The Impact of Urbanization on Agriculture Sector: A Case Study of Peshawar, Pakistan

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Abstract
By recognizing the socio-economic factors of urbanization, that lead to the loss of agricultural land it is important to design policies for combating agriculture land loss. This study aim is to identify the socio economic factors that cause land loss in Peshawar. The dependent variable urban population is used as a proxy to measure urbanization. We examined five explanatory variables, arable land, GDP per capita growth, agriculture value added (% of GDP), agriculture value added (annual % of growth) and cereal production. The results indicates that both agriculture value added % of GDP and agricultural value added annual % of growth had a negative relationship with the urban population , it means that as the urbanization rises more and more agricultural land is converted to non agricultural uses which lead to the reduction of agricultural production. The result shows the urgent attention of the policy makers towards the policy implication for the land management to prevent further agricultural land loss.

INTRODUCTION

As we begin to recognize the scope of human influence on biosphere it is important to understand how the specific forms of human induced land transformation affects the dynamics of the earth biological ecosystem. Human activities , rather than natural forces are the major sources of the contemporary changes in the state and flow of the biosphere .land transformation due to human activities have taken many forms , starting with the fire management, herding practices , development of agriculture and culminating with urbanization including industrial expansion. Land transformation is one of the most important fields of human induced environmental transformation. Land transformation did not decreased but rather accelerated and diversified with the onset of industrial revolution and globalization of the world economy and the expansion of population.

Past studies of the biosphere estimate that about one /third to one /half of the earth's land surface has been transformed by human activities. Recent studies have shown that urban development is taking place on the most fertile and productive land. We need to understand what has urbanization underpinned in the past and it is bringing changes in the future. While their numerous issues that could be addressed concerning urban influences on the biosphere ranging from the conversion of land itself to a broader context of the ecosystem services required for the recycling urban metabolic by products . The food security and the loss in the agricultural products is the most distinct impact of the wide spread expansion of the activities in both rural and urban areas.

PROBLEM STATEMENT

Conversion of agricultural land to non agricultural uses is probably more intensive in Khyber Pakhtunkhwa than other provinces of the country. A prominent feature of this global trend of urbanization is forced displacement triggered by armed conflict, violence, political instability or slow and sudden onset disasters or a combination of these factors. To accommodate the natural population growth of the region and the influx of the people from the other areas, more and more agricultural land is being converted to non agricultural uses. The present research evaluates the relationship of certain economic factors to the loss of the prime agricultural land in order to determine that to what extent agricultural land has been lost and to make projections of what might be expected in the near future

LITRETURE REVIEW

Land conversion is a process by which land is converted from agricultural to urban uses. There is a dispute on whether agricultural land fringing should be maintained or converted to other uses. This debate can be revealed from both the pro-ruralist and the pro-urbanist perspectives. In the pro- ruralist's view, land conversion has negative impacts; the loss of prime agricultural land reduced agricultural jobs and devastated investment in irrigation infrastructure. Consequently, it could affect agricultural production and intimidate the food security.

Pro- ruralists, conclude that agricultural land should be reserved to maintain food production. On the other-hand, the pro-urbanites argue that land conversion is a logical outcome of urban growth. The decrease of agricultural production, they suggest, can be resolved by intensification and technological development. Hence, land conversion is not thought as a threat in their view. (Tan et al., 2009) states that land conversion is a phenomenon that is almost inevitable during economic development and population growth periods. However, uncontrolled land conversion has greater impact on environment in general and agricultural yield in particular. (Lichtenberg and Ding, 2008) asserted that subsequently, some countries such as China, Japan and the USA have tried to conserve agricultural land from being transformed to other uses. (Ho and Lin, 2004) found that in China, since 1980, the transfer of agricultural land to non-agricultural land has been extensive and intense. Higher population density, rapid economic development and the urbanization process are assumed to be the main factors of resulting agricultural land conversion (ALC) in China. (Tan et al., 2009) and (Agus and Irawan, 2006) showed that, in 1995, ALC accounted for more than two-third of the loss in cultivated land in several areas. During 1996–2000, the rate of ALC in The Netherlands was only 17ha per day while in Germany in 2006 the rate was 114ha per day. Such rates are much lower than in China and Indonesia which respectively experienced 802 ha in 2004 and 514ha per day in 2000–2002. The above report makes it clear that the rate of ALC is different in both developed and developing countries. It is therefore vital to discover the main drivers of ALC in different countries.

Agricultural Land Conversion Drivers, The phenomenon of ALC in different countries is different in terms of intensity and trend. According to (Lichtenberg and Ding, 2008) there are two major drivers that contribute to ALC; internal and external. Land degradation & development and industrialization .The internal drivers land degradation is related to the location and land potential including land productivity, ownership pattern including land size and household size and income. The later includes urbanization, socio-economic conditions and government policies. External driver is Industrialization. Industrial development is widely seen as an engine for economic growth. (Ho and Lin, 2004) stated that, China, is known for its rapid economic growth. During the 1980s–1990s, Chinese growth was strongly supported by the development of China's rural non-agricultural sector, particularly the expansion of enterprises owned by rural communities, known as township village enterprises (TVEs) In China, rural industries are located in areas where agriculture is better developed and located close to urban centers. The 62% of TVEs were located in coastal provinces; hence, the rural industries exerted significantly more pressure on rural communities to divert from agricultural land to non-agricultural uses. Firman (1999) found that industrial estates development, mainly in regions surrounding Jakarta, was the main reason of causing widespread ALC in Indonesia. This land conversion was followed by other transformations also. There are some regions such as peripheral areas that show a transition from agricultural economy to industrial and service-based activities. This conversion is also reflected by employment structure. The employment structure converges from a primary economy to secondary and tertiary industries. Additionally, the number of households involved in agricultural actions was declining. The policy to attract foreign direct investments and to develop global competitiveness in Indonesia's industrial sector exacerbates rapid ALC in the urban periphery. This strategy stimulates the development of many light industries such as footwear, electronics and plastics manufacturing. The strategy has therefore made the ALC more severe.

The urbanization progression and rural–urban migration are two major factors that influence ALC and have been extensively studied. (Han and He 1999) studied the distribution pattern of farmland loss in numerous cities in China and also examined the relationship between urbanization and farmland transformation in the cities. They found that there was a significant positive relationship between the urban population growth (as the main measurement of urbanization) and farmland conversion in coastal cities. (Ho and Lin's 2004) study showed that industrialization also causes farmland conversion in coastal cities in China. They concluded that the industrialization process in China is regularly synchronized with urbanization and therefore causes farmland conversion .Rapid population growth influences ALC as greater population leads the expansion of built areas to provide more housing and employment opportunities.(Fazal 2001) describes how urbanization influences ALC in India. He argued that the urbanization pattern and high population growth in developing and underdeveloped countries leads to pressure on land. This urban growth encroaches on fertile agricultural lands. India has experienced massive loss of agricultural land due to rapid urbanization and the expansion of urban areas combined with rising population. (Fir man, 1997) argued that housing development is one of the main activities that have caused ALC in Indonesia, during the last 20years. Housing development has taken place very intensively in the outskirts of Jakarta. (Han and He 1999) also noted that the real estate speculation, which is a new phenomenon in China, is a major cause for fast reduction of farmlands. They argued that another dilemma in real estate development that directly affects farmland conversion was unproductive use of the converted lands. Due to this, there was a large part of the land parcels flagged for industrial or residential development which was left vacant for a long time. (Malaque and Yokohari, 2007), Metro Manila, is another city that has suffered from ALC due to the urbanization process. There was a period of land development in the urban extreme of Metro Manila, between 1982 and 1997. This period was mostly influenced by a policy that encouraged the expansion of

industries in rural areas and made land conversion a general phenomenon in the City.
Infrastructure development, such as road construction also contributes to ALC in most countries. China has faced such pressures about two decades ago. (Lichtenberg and Ding, 2008) showed that as the industry grows rapidly, the agricultural sector becomes commercialized, the people's income grows, and the number of commuting people increases, China's insufficient road system becomes more congested. A reliable and efficient transport infrastructure is therefore needed for sustainable economic growth. According to (Ho and Lin 2004), the various road projects in China needs a large amount of agricultural land. Many scholars consider the road construction that supports industrial development and links to highways, had lead to encroachment on fertile agricultural land.

According to (Van den Berg et al., 2003; Malaque and Yokohari, 2007; Irawan, 2008; Lichtenberg and Ding, 2008) Most of the economic development policies tend to promote industrial growth and indirectly stimulate intensive land conversion in many developing countries, like Indonesia, China, Vietnam, and the Philippines. Furthermore, spatial development policy, which determines whether an area becomes industrial site or residential, boosts the conversion of agricultural land in that area. (Levia and Page, 2000) examined the driving forces of ALC to residential uses. Farm size, farm slope and distance to nearest cities and highways are the variables hypothesized as factors fostering farmland conversion of agricultural land in that area on in Massachusetts. They found that all those variables are the primary determinants of the ALC.

(IPCC, 2000; Lutz et al., 2001) asserted that world population will grow to about 10–14 billion by the year 2100, with a median projection at 8.8 billion forth year 2050. (Keyzer et al., 2001) stated that, as income rises, people tend to consume more calories in total, and the global meat consumption can be expected to rise by up to 3% annually over the next decades. While global food supply according to (Harris and Kennedy, 1999; Rosé grant et al., 1997) may still outpace demand up to 2020, growth rates in production are likely to slow down in the longer run. (Qaim and Zilberman, 2003)stated that the potential of biotechnology and genetic engineering for increasing agricultural yields remains unclear and subject to a strong public debate . Moreover, (Sands and Leimbach, 2003) narrated that total land area available for agricultural production will be increasingly constrained by land requirements for other purposes, like infrastructure development, urbanization ,Bio-energy production, or biodiversity protection. The combined effects of various changes are still highly uncertain (IPCC, 2007); Global land-use patterns will change in the future. Projecting their future development it is important to study both their impacts on the Earth System as well as the limitations of land use, since freshwater and fertile land is only available in limited amounts.

Pakistan like other developing countries in the region has witnessed accelerated process of urbanization. The country experienced extensive urban population explosion. This resulted in severe pressure on the urban land and infrastructure of big cities in the country

In Pakistan, urbanization is not only concerned with big cities getting bigger. It is also about increasingly population-dense rural regions, areas that are not officially designated as city space, yet nonetheless have many fringes of urban life. (Qadeer, 2013) writes, increasing urban space is transforming socioeconomic conditions across Pakistan. Agriculture's share in gross domestic product (GDP) has decreased, while the services and construction sectors have become key contributors to both GDP and employment.

(Mahmood Hassan Khan 1991) ,the research problems of other areas, particularly Baluchistan and KPK, deserve strong commitment for at least two reasons, firstly its agricultural problems are in many ways more complex and intractable, and secondly there is the problem of grossly inadequate information and data on these problems

Prospects of Agricultural Development in KPK

(MINFAL and JICA, 2002) states that, KPK and FATA constitute 16 percent of the population of Pakistan. Total reported agricultural land in the province is 13.89 million acres. Of this 22.23 percent is forested and 23.90 percent is under crop cultivation in addition to 22.49 percent cultivable land that is not utilized for want of water. (PARC, 2002) reported that, the province and adjacent tribal areas have a unique feature of extremely diversified agriculture. The diversity of agriculture of this district is reflected in the map of agro-climatic zones of Pakistan prepared by Agricultural Research Council, where 6 out of 10 zones appear in the Frontier Province. Moreover, the province is capable of producing varieties of crops, fruits, vegetables, sericulture, floriculture, and medicinal herbs which are quite rare in the country.

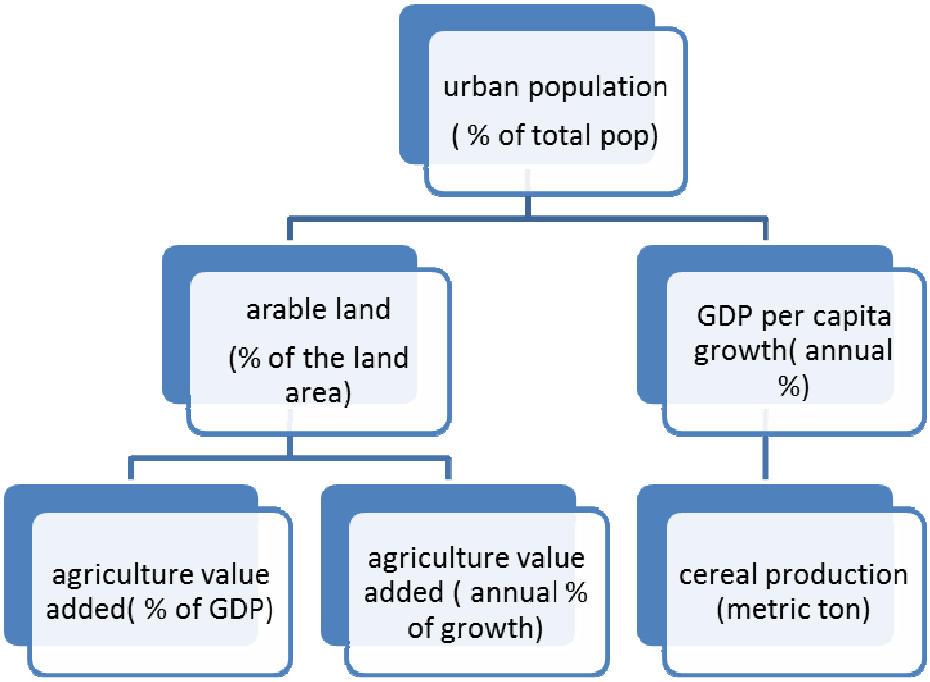
(Nazir and Jalely, 1992) asserted that, agriculture engages 48 percent of the total labor force and contributes 40 percent to the GDP of province. Wheat and maize are the major food crops of the province. KPK produces, 8 percent and 60 percent of the wheat and maize produced in Pakistan. Crop yield per acre of food grain is far below attainable potential levels. Sugar cane and sugar beet are main cash crops. About 15 percent of the total sugarcane of Pakistan is produced in KPK, in addition to sugar beet production in (Mardan and Charsadda). Sugar beet is a very efficient sugar crop and produces more sugar than sugarcane. Tobacco is another cash crop of the Frontier province and it accounts for about 90 percent of the total Virginia tobacco grown in Pakistan. (Mian, 1980) stated that, the province has potential to increase its tobacco production.

According to the report by (Frontier Post, 1996), Tobacco is providing sizeable revenue for the government. The provincial income from tobacco equals Rs.50 billion and acknowledged that government pays only Rs.7.2 billion out of this lump sum.

(Izhar and Lalazar, 2012) showed that, while current reliable data is scarce (the last Peshawar census was conducted in 1998), Peshawar's population is estimated to be 3.3m – up from 1.7m in 1998. In 1998, population density was 1,612 persons per km2; in 2010, it was 2,459 per km2. (IMMAP, 2012) asserted that, growth is estimated to be 3.29% per year, higher than many other Pakistani cities.

THEORATICAL FRAMEWORK

The dependent variable urban population is used as proxy to measure urbanization. Based on the review of the literature regarding the common determinants of the land conversion and the availability of the data on the national level, we examine five explanatory variables. The arable land, represent s how much arable land is available in the country. It also explains how much of this land is converted to non agricultural uses. The annual growth rate of Gross Domestic Product per capita reflects the economic development in the country which is often an important underlying factor in the land conversion. The race of rapid GDP growth mainly found in urban areas mostly triggers agricultural land in rural and remote areas. However, rapid economic growth in urban areas demands more food that often creates greater economic incentives for farmers to increase their crop production. Agricultural growth indicated by the agriculture value added %of GDP or agricultural value added annual % of growth might have negative relationship with the urban population. The annual growth rate of cereal production represents trends in agricultural production, which might be decreased by the urban expansion.



MODEL AND RESULTS

Using ordinary least square regression, the basic statistical model selected is;

MODEL

Y= BX1+BX2+BX3+BX4+Bx5
Y=urban population (% of total pop)
X1=arable land (% of land area)
X2=GDP per capita growth (annual %)
X3=agriculture value added (% of GDP)
X4=agriculture value added (annual % of growth)
X5= cereal production (metric ton)

The unit root test is applied to test staionarity of the data; it was found that the data is stationary at the 2nd difference test applied.

Name of variable	**I(0) (Level)**	
	ADF Test Statistic	**5% Critical Value**
urban population (% of total pop)	**0.775666**	**-3.1483**
arable land (% of land area	**-1.590008**	**-3.1483**
GDP per capita growth (annual %)	**-2.316617**	**-3.1483**
agriculture value added(% of GDP)	**-0.993049**	**-3.1483**
agriculture value added (annual % of growth)	**-2.697488**	**-3.1483**
cereal production(metric ton)	**-0.528873**	**-3.1483**

We apply the unit root test on all variables both dependent and independent variables. The above table shows the results of stationary on Level. The first variable is Urban population, the ADF test statistics value is 0.775666 which is greater than 5% critical value (-3.1483) so on level the Urban Population data is not stationary. The second variable is Arable Land which is also not stationary at level. GDP per capita growth is also not stationary on level. Other variables Agriculture value added (annual % of growth) and Agriculture value added (annual % of growth) are also not stationary at level. The last variable is Cereal production (metric ton) the ADF test statistic value is -0.528873 which is greater than the 5% critical value (-3.1483) so not stationary at level.

Name of variable	**I(1) (1st difference)**	
	ADF Test Statistic	**5% Critical Value**
urban population (% of total pop)	**0.304270**	**-3.1801**
arable land (% of land area)	**-2.943370**	**-3.1801**
GDP per capita growth (annual %)	**-1.295278**	**-3.1801**
agriculture value added(% of GDP)	**-1.524222**	**-3.1801**
agriculture value added (annual % of growth)	**-1.710739**	**-3.1801**
cereal production(metric ton)	**-1.178391**	**-3.1801**

For checking the stationarity of the variable we use Unit root test. The above table is the results of the stationarity at 1st difference of all variables. Urban population, the ADF test statistic value is 0.304270 which is greater than 5% critical value (-3.1801) so at 1st difference the data of Urban population is not stationary. Other variables are Arable land, GDP per capita growth, agriculture value added (% of GDP), agriculture value added (annual % of growth) these all variables have greater value of ADF test statistic value from their 5% critical value so it means the data is not stationary at 1st difference. The last variable is Cereal production (metric ton) their 5% critical value is -3.1801 which is less than the ADF test statistic value (-1.178391) so it shows that the data of Cereal production (metric ton) is not stationary at 1st difference.

Name of variable	**I(2) (2nd difference)**	
	ADF Test Statistic	**5% Critical Value**
urban population (% of total pop)	-3.509159	-3.2195
arable land (% of land area)	-3.748401	-3.2195
GDP per capita growth (annual %)	-4.066860	-3.2195
agriculture value added(% of GDP)	-4.161148	-3.2195
agriculture value added (annual % of growth)	-6.641700	-3.2195
cereal production(metric ton)	-3.304330	-3.2195

The table shows the result of the unit root test at 2nd difference. The urban population ADF test statistic value is -3.509159 which is less than 5% critical value (-3.2195) so it means that the data of urban population is stationary at 2nd difference. The other variable ADF test statistics value are Arable land (-3.748401), GDP per capita growth (-4.066860), Agriculture value added % of GDP (-4.161148) Agriculture value added annual % of growth (-6.641700) which is less than their 5% critical value (-3.2195) which shows that the data of these variables are stationary at 2nd difference. The last variable of the above table are Cereal production (metric ton) which has ADF test statistic value is -3.304330 which is less than 5% critical value (-3.2195) so it means that stationary at 2nd difference.

Test of Autocorrelation:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.863608	Probability	0.234686
Obs*R-squared	5.364436	Probability	0.068411

For checking the autocorrelation problem in the model we used Breusch-Godfrey serial correlation LM test. The probability value is 0.068411 which is greater than 0.05 or 5% so there is no autocorrelation problem in the model.

Main regression

Dependent Variable: UP
Method: Least Squares
Sample: 2000 2013
Included observations: 14

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.433816	2.210234	2.006428	0.0252
AL	1.594031	0.609632	2.614743	0.0184
AVAGDP	-0.528198	0.153074	-3.450605	0.0054
AVDAG	-0.216919	0.083232	-2.606194	0.0413
CP	4.11E-07	7.31E-08	5.620840	0.0005
GPC	0.459951	0.142876	3.219232	0.0258

R-squared	0.925149	Mean dependent var	35.35500
Adjusted R-squared	0.878367	S.D. dependent var	1.516584
S.E. of regression	0.528922	Akaike info criterion	1.861575
Sum squared resid	2.238067	Schwarz criterion	2.135457
Log likelihood	-7.031027	F-statistic	19.77583
Durbin-Watson stat	2.116963	Prob(F-statistic)	0.000258

The dependent variable of this study is Urban population (UP) and independent variables are Arable land, agriculture value added (% in GDP), agriculture value added (annual % in growth), Cereal production (Metric ton) and GDP per capita growth.

The coefficient value shows the positive and negative relationship between dependent variable and independent variables. The coefficient value of Arable Land is 1.594031 which shows that the dependent variable urban population and independent variable Arable Land has positive relationship. Similarly agriculture value added % in GDP (-0.28198) which mean negative relationship between urban population and agriculture value added (% in GDP). The coefficient value of agriculture value added (annual % in growth) is -0.216916 which also means that negative relationship between urban population which is dependent variable and agriculture value added (annual % in growth). The coefficient value of Cereal production (Metric ton) is 4.11E-07 and GDP per capita growth is 0.459951 which shows that both variables have positive relationship with dependent variable urban population.

The probability values show the significant of dependent variable with independent variables. The probability value of Arable Land is 0.0184; agriculture value added % in GDP is 0.0054, agriculture value added (annual % in growth) is 0.0413, Cereal production (Metric ton) is 0.0005 and last variable GDP per capita growth the probability value is 0.0258 all variables the probability value is less than 0.05 so it means that there is significant relationship between all independent variables (Arable land, agriculture value added (% in GDP), agriculture value added (annual % in growth), Cereal production (Metric ton) and GDP per capita growth) and dependent variable Urban population (UP).

R-squared value is 0.92 which shows that 92% variations come in dependent variable from independent variable and the remaining 8% variations are from error term.

The prob (F-statistic) value is 0.000258 which is less than 0.05 so the overall model is significant.

CONCLUSION

Pakistan is a country with huge population and a scarcity of land per capita. This determines the value of cultivated land to the people. The rapid growing economy has resulted in an expansion in urbanization and the influx of migrants from rural to urban areas all over the country. The growing population and its needs, particularly in urban areas demands more land that is fixed in supply. In order to meet the increasing demand for land, city development expands to areas where fertile agricultural lands are available. This development leads to the intensive land conversion in the urban areas .Agricultural land conversion is considered as a logical result of population growth and economic development and it has been neglected as an avoidable consequence in the

process of development. Urbanization is therefore argued as a threat to agricultural land. With rapid economic growth, the economic structure shifts from agricultural to non agricultural based economy. Aside from the direct loss of production capacity, land has also impact on the present state of agriculture .It lead to the additional burden on the present farming conditions, which may further worsen the situation. The results indicates that both agriculture value added % of GDP and agricultural value added annual % of growth had a negative relationship with the urban population , it means that as the urbanization rises more and more agricultural land is converted to non agricultural uses which lead to the reduction of agricultural production. To discourage this conversion the policy makers should focus on this major issue.

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