

Do Institutions and Land-Use Change conflicts affect Land Degradation? Attestation through Different Observed Options, from the Selected Regions of Pakistan

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Abstract

Land degradation is a growing problem of Pakistan, which causes biomass loss and has a bad effect on the economy of the country. Northeast of Punjab province, which is famous for the rice cultivation, is also suffering with this problem. Along with some other reasons, institutional setup in the regions and the land-use change are the main reasons of this degradation. Although the land is owned by private owners, but because of the malfunctioning of existing property rights and the recent urban expansion in the region has provoked interfamily conflicts between landowners related to land alienation. These conflicts have a potential of jeopardizing rural setup and agriculture production of the country. The aim of the study is to approach these conflicts, focus on the need of institutional change for the proper use of agriculturally degraded land. The Institutions of Sustainability Framework of Hagedorn et al (2002) has been employed, and some policy recommendations are derived.

Key Word: Land Degradation, Institutional Conflicts, Land-use Change Conflicts,

1. Introduction

Land degradation, the result of a number of interrelated natural and anthropogenic factors, can also be defined as the conversion of land from high production of biomass to urban uses with low production of biomass (Johnson and Lewis 2007: 164). Creation of housing, industry and infrastructure development are such urban uses, which put pressure on the land-use for the settlement of population burden, and cause disturbance on natural land and as a result vegetation is lost (Brower and Chadwich 1991: 7, Joshop et al. (2004), Xiubin 1996, Johnson and Lewis 2007, Zhao-hua 2006).

This problem of land degradation is also very common in Pakistan. Agriculture is the mainstay of the economy, although its share in GDP has declined over time to 21.8 % (Economic Survey of Pakistan 2010-11). This declined share is mainly because of degradation of land. Approximately, 7.4 million hectares land is being affected by different agricultural diseases (Sarfraz 2000: 1). Pakistan's National Conservation Strategy states that this loss of biomass is the result of a quite alarming situation of land-use change because of urbanization (Pakistan Environmental Protection Agency).

Urban growth of rural land has been observed in different regions of Pakistan, for example, in the Northeast region of Punjab rice cultivation has suffered from a secular decline. Land holdings in this region are of private regime of 35 acres. Initially, it was used for agriculture farming and livestock

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production, under the influence of the natural vegetation and promoted by the culture of the inhabitants for an extremely long time and was not disturbed anthropogenically. Currently, majority of landowners are poor and illiterate,² with little awareness of land-use change effects on the productivity of land. This unawareness, along with the absence of land management and agricultural policy, causes land-use conflicts (Hite 1998) because of the involvement of some other interest seekers e.g., real estate builders and industrialists to influence the decisions related to land-use for their own interest. These conflicts cause land degradation (FAO/BFFP).

Even though an enormous body of literature is available on land-use change and land degradation, as far as I know, no one has estimated the effects of land distribution conflicts and land-use conflicts on land degradation. My study is an addition to the existing literature, as it measures the relationship between these variables, along with the ranking of all available options for land-use in the study regions with respect to their worsening of land productivity.

2. Case Study Selection

For the analysis of the relationship between land degradation and property rights, a case study approach was followed, and the case regions were selected through the soil survey of Institute of Soil Fertility, Lahore. Three main regions, named Shaikhupura Kamoki Region, Qadirabad Dam Region, Nandipur Region, were selected in northeast of Punjab, with different levels of land degradation among the twenty one villages (seven villages in each region) shown in Figure 1. These villages were randomly selected on the basis of their distance from the grand trunk road and link roads among the large cities. Later, one village had to be eliminated from the study because of a disturbed law-and-order situation attributable to one family conflict regarding land distribution. Data for three main variables, viz., (1) intergenerational land distributional conflicts, (2) conflicts regarding land transfer to the actual landowners, and (3) land-use change conflicts, for the empirical investigation of land degradation was collected from these three regions.

² According to the data of the Economic Survey of Pakistan 2008-09, illiteracy in rural areas is 51 percent.

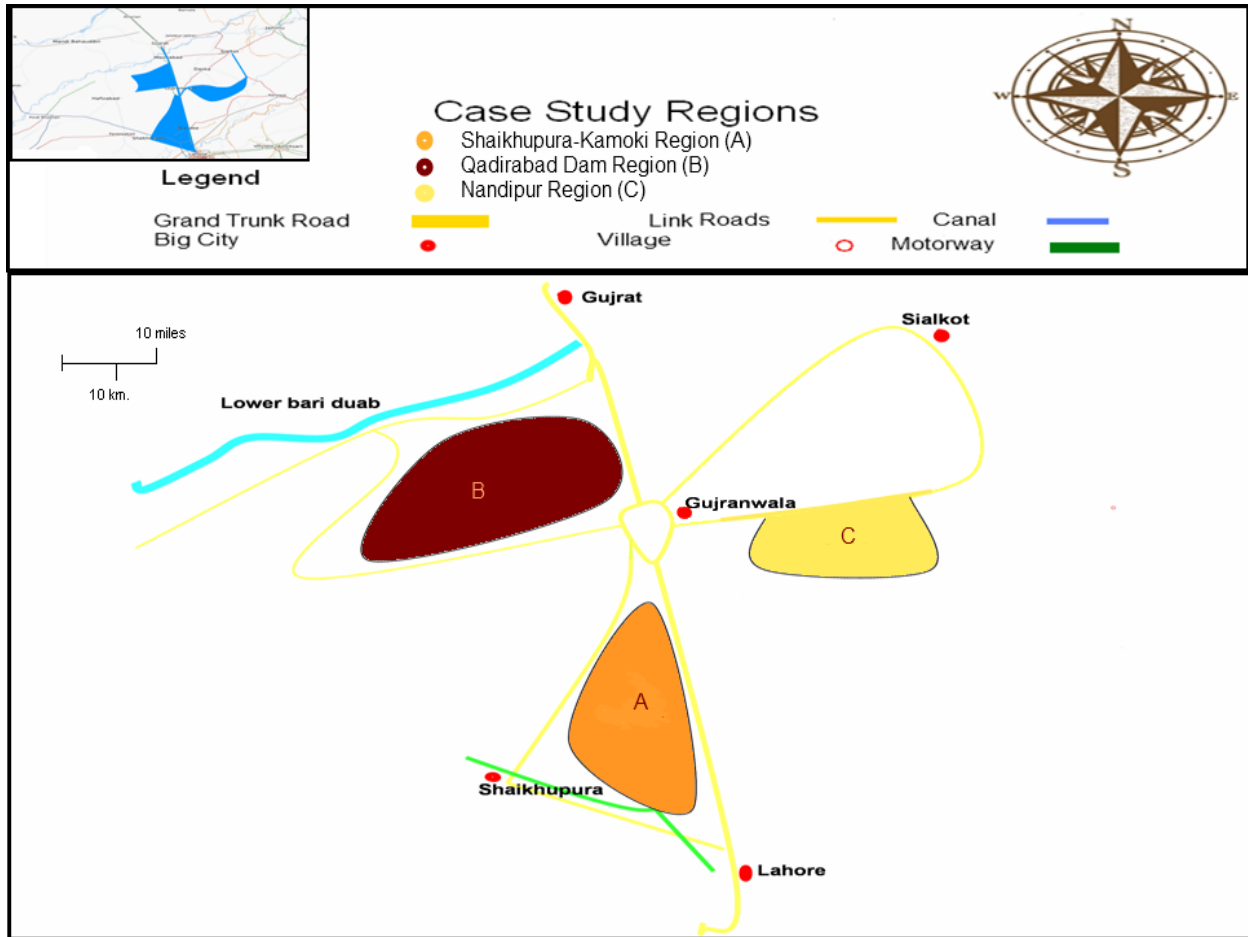


Figure 1: Case Study Regions
 Source: Own Presentation

The field study was conducted over a period of three months, and during the selection of regions and villages, officials and experts in various research institutes and government offices were also visited for the collection of documents related to the study. Once the problems of the areas had been explored, detailed interviews of the landowners were conducted. For this investigation, after group discussions, a household survey was conducted for one hundred and fifty households, which were selected through stratified random sampling. Each stratum was designated as affected land because of degradation.

2.1 Theories and Framework

The theoretical approach includes the investigation of land degradation as a problem and the constraint for proper land usage of some areas of Pakistan, while evaluating how property rights work to reduce land degradation. The analysis is based on the distributional theory of institutional change, explains institutions as a structured set of rules for social interaction and social conflicts

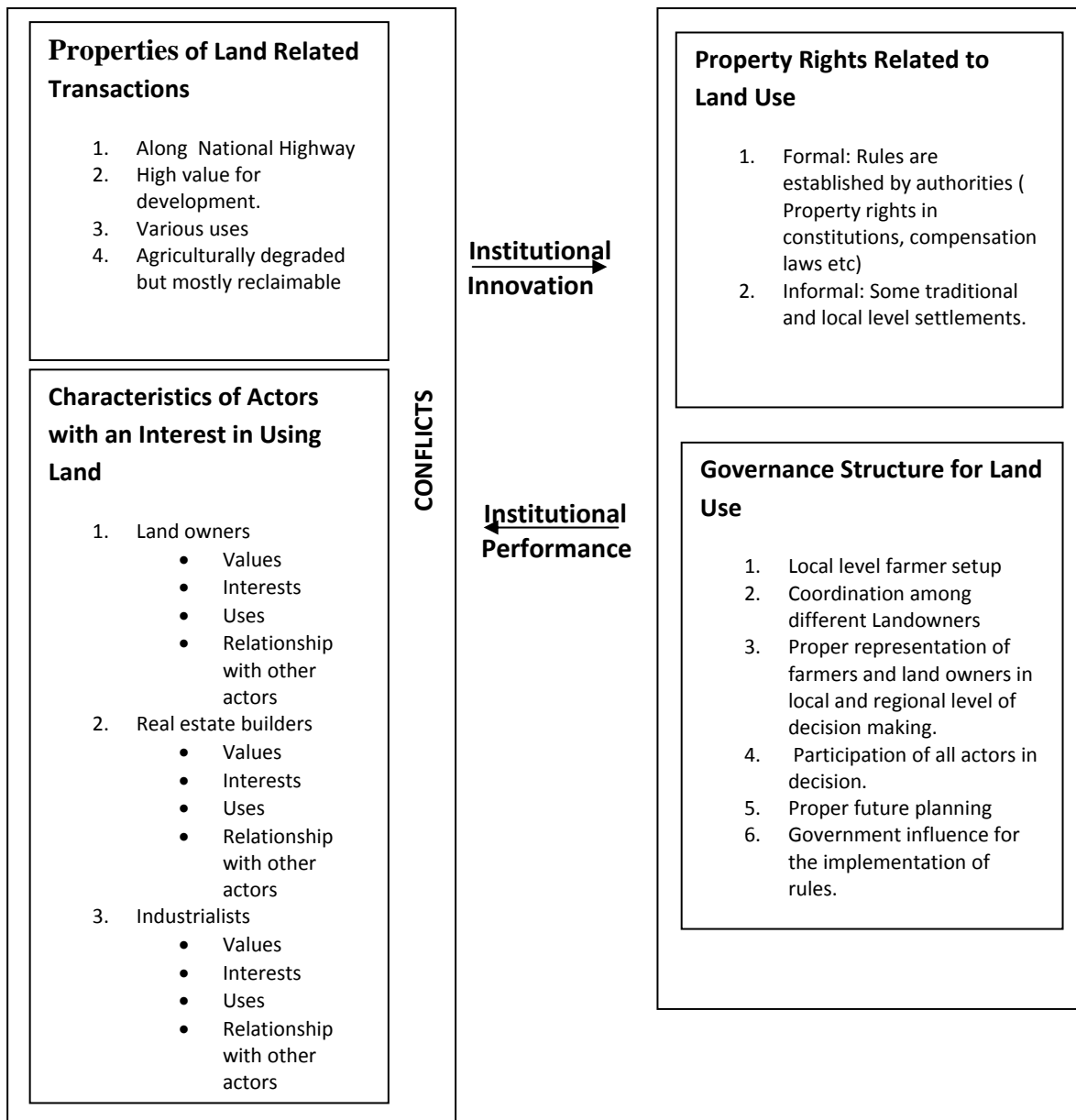


Figure 2: Framework for Analysis of Role of Property Rights in Land Degradation and Land-use Conflicts
Source: Based on Hagedorn et al. (2002: 4)

3. Results

3.1 Different Options for Land-use Change Observed in the Region

Mainly, nine different options for the land use were observed in the region; these are presented in Table 2. For all these options, landowners from all visited households were asked, whether they were interested in a change in land use or not, and the response of land-use change conflicts were tested against land degradation. Cuse1 is the variable for the response of the respondent 1 (R1) from each

household, and Cuse2 is the variable for the response of the respondent 2 (R2) from each household. The results are presented in the Table 3.

Table 2: Land-use Options in the Regions

Option	Explanation
Agricultural Use	Land is used for agriculture by the landowner, or he may rent it or sell it
Housing Society	Land is used for residential plots of various sizes, together with the relevant infrastructure such as roads and sewerage systems, plus other facilities such as Mosque, super markets, and play grounds
Industry	Land use includes both manufacturing and processing units
CNG Filling Stations and Patrol Pumps	Land is used for facilities to provide compressed natural gas and patrol used in vehicles as fuel
Hotel and Marriage Hall	Land is used for hotels and marriage halls for public use on payment
Fish Farming	A shift of business
Poultry Farming	A shift of business
Government Acquisition	Land is used for the construction of road or other major projects
Others	Land is used for play grounds or is left in trust

Source: Survey 2008

These results show the positive relationship between the land-use change decisions of landowners and land degradation. This indicates that, when landowners take a decision for higher returns, they have to pay a cost in the form of land deterioration. More land is degraded when an additional household decides on land-use change.

In the case of conflict analysis for land-use change response in SKR, the estimates proved that the decisions of respondents 1, who are generally loyal to their traditions and not believe in huge changes, such as from mono-cropping to multiple cropping, are harmful to the land, as they stick to the old systems and want to survive in the old setup. On the other hand, the decision of respondent 2 is also not appropriate as they want to change the use of land without any sufficient knowledge and planning.

In QR, the case is slightly different; because most of the landowners are already convinced of the new use of land for a better standard of living, and respondents 2 want further to change it, because they think that they can obtain even more returns from this new use, although respondents 1 are not supportive of this further new change. Both the old and new changes cause land degradation, which may increase with any change in the decision of another household for land use.

Table 3: Results of the Effects of Land-use Change on Land Degradation for all Study Regions

Variables	Estimated Coefficients	t values
Results for SKR		
Constant	6.06	1.06
Respondent (R1) is in favor of land-use change (Cuse1)	12.14	2.47**
Respondent (R2) is in favor of land-use change (Cuse2)	9.55	1.52***
Results for QR		
Constant	7.44	0.82
Respondent (R1) is in favor of land-use change (Cuse1)	12.85	1.51***
Respondent (R2) is in favor of land-use change (Cuse2)	14.28	1.82***
Results for NR		
Constant	4.80	16.10*
Respondent (R1) is in favor of land-use change (Cuse1)	0.56	1.57***
Respondent (R2) is in favor of land-use change (Cuse2)	0.62	1.66***

Source: Field Survey 2008

* Significant at level 0.01

** Significant at level 0.05

*** Significant at level 0.10

In case of the Nandipur region, the response is lower meaning that the people in this region are not in the favor of such a change, which increases the land degradation, and the land-use pattern is much more favorable to resource conservation. These results show that, although a change has a negative impact on the land, the landowners are in favor of this change, because they want to maximize their individual returns and ignore social costs and losses in the form of resource damage.

3.2 Effectiveness of Land-use Options for the Degradation of Land

To check which is the most dangerous among these land-use options for land degradation, the efficiency of land degradation with respect to every option was calculated. For this, three separate regression Equations were estimated for the three regions, as land degradation was a dependent variable, and the different options were independent. To estimate the response of the question as to which option more efficiently participates in the process of land degradation, the effectiveness of land degradation with respect to each option was calculated by using all options separately.

In the case of the study region Shaikhupura-Kamoki, the Equation was estimated for four different options; however, one option (CNG and filling station) was dropped from this analysis, because of the collinearity problem in estimation. The four options, viz., fish farming; poultry farming, hotel and marriage hall, and others were constant and were not included in the estimation. All other remaining options showed a positive response, with land degradation in the region; the results are summarized in Table 4.

Table 4: Results of Estimated Variables in the Case of SKR

Variables	Estimated Coefficients	t values	Effectiveness
Constant	20.00	3.48**	
Agricultural Use (A)	-9.80	-1.56***	-0.23
Housing (H)	12.22	1.70***	0.10
Industry (I)	11.13	1.52***	0.08
Government Acquisition (G)	35.00	3.73**	0.09

Source: Field Survey 2008

* Significant at level 0.01

** Significant at level 0.05

*** Significant at level 0.10

According to the estimated Equation, the value of the coefficient of agricultural use is negative, which means that, with an increase of land use for agriculture, land degradation will decrease. All remaining estimated variables have a positive relationship with land degradation and suggest that, with an increase in these variables, land degradation will also increase. Government acquisition has the strongest effect, as its estimated coefficient is 35.

Table 5: Results of Estimated Variables in the Case of QR

Variables	Estimated Coefficients	t values	Effectiveness
Constant	13.75	1.60***	
Agricultural Use (A)	15.06	1.61***	0.20
Housing (H)	32.92	2.97**	0.13
Industry (I)	41.25	2.15**	0.03
Hotel and Marriage Halls (H&MH)	11.92	0.91	0.02
Fishing Farms (F)	18.72	1.92***	0.15
Poultry Farming (P)	28.25	1.90***	0.04

Source: Field Survey 2008

* Significant at level 0.01

** Significant at level 0.05

*** Significant at level 0.10

In the case of the Qadirabad Dam region, six variables were estimated, and coefficients for all the determinants were positive and proved to cause an increase in land degradation in the region (Table

5). The coefficient for industry has a maximum value, which indicates that additional industry in the region would be dangerous, and the land will be affected because of land-use change. On the other hand, agriculture is significant but causes the least effect on land in comparison with the other variables. Most of the variables in this case are significant at the ninety percent confidence interval. Similarly, in the last case study region, the regression model was estimated for three out of nine options (Table 6).

Table 6: Results of Estimated Variables in the Case of NR

Variables	Estimated Coefficients	t values	Effectiveness
Constant	5.63	12.94*	
Agricultural Use(A)	-0.70	-1.50***	-0.074
Industry (I)	1.33	2.58**	0.056
Government Acquisition (G)	1.38	1.83***	0.015

Source: Field Survey 2008
 * Significant at level 0.01
 ** Significant at level 0.05
 *** Significant at level 0.10

These results also indicate that agriculture as a land-use change is a favorable option and is negatively related to land degradation. This means that, if more land was cultivated, less land would be degraded. Although the effect of this variable is quite small, it has some significance. The other two effective variables are industry and government acquisition, which have a positive impact; thus, if land was used for these changes, more land would be degraded because of biomass loss (Figure 3).

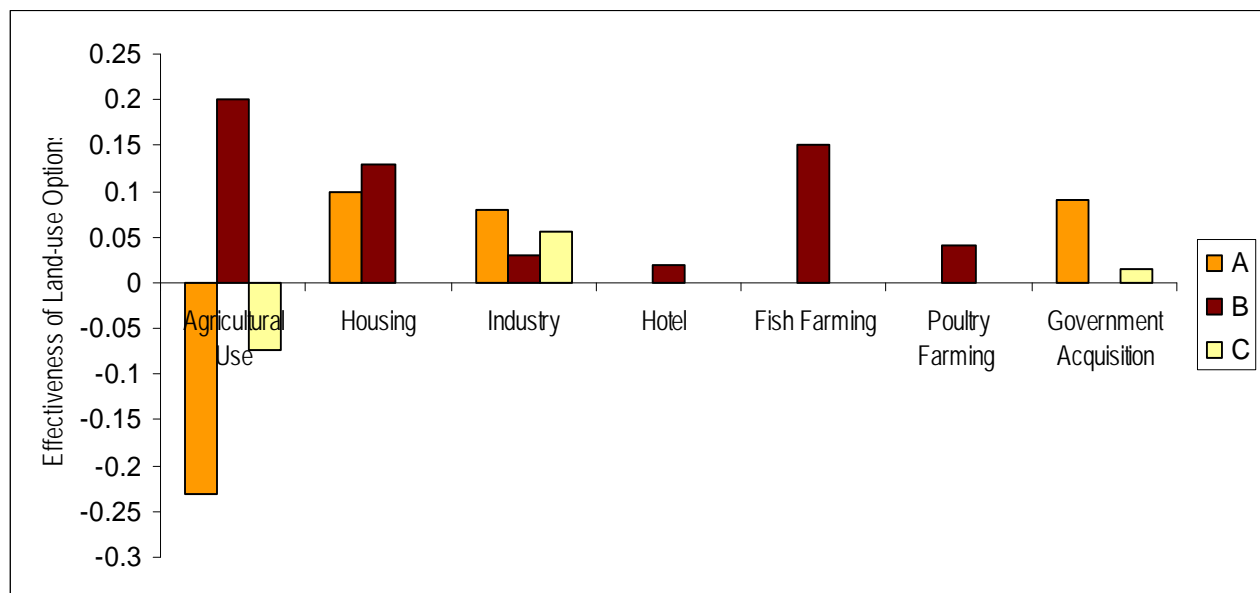


Figure 3: Effectiveness of different Options to Combat Land Degradation
 Source: Own Presentation

In case of Agriculture-use, the major focus was the cultivation of a cash crop, mainly rice, by using some advanced feasible technologies. Technological changes and policies for an increase in output gave concerns about their effects on soil productivity. Real effects on land degradation were evident with extensive use of the small plots and because of mono-cropping; these two effects resulted in soil exhaustion. The problem was exacerbated by the continuous production of rice season after the season, without alternative crop cultivation.

Most of the landowners in these regions have changed their mind set with regard to cultivation, as now they grow wheat and some other crops on their land, instead of just rice, because of the shortage of water in the region and the change in the quality of land for the production of rice. Because of this, the estimated results for agricultural use from the data obtained through a survey in the two regions SKR and NR have a negative effect on land degradation. In the case of QR, people remain loyal to mono-cropping, which causes land degradation.

Housing and Real Estate Building is a fast growing business in these regions of Pakistan because of the surroundings, as these regions are sandwiched between large cities and are highly suitable for job opportunities. During and after the construction of a housing society, the soil would be exposed leading to the vulnerable erosion (Soil fertility research centre, Lahore: 2001), causes loss of agricultural output (Johnson and Lewis 2007: 164). Similarly contamination of concrete and paint in soil and underground water (Environmental protection agency, Gujranwala), and because of this contamination soil become less permeable and changes the direction of water which is not favorable for other parts of agricultural land (Soil fertility research centre, Lahore: 2001).

Together with all these limitations, most of the conflicts related to the land distribution were linked to this use in one form or another. Existing laws for the protection of environment are not implemented because of private property. Currently, nineteen percent landowners were involved, and twenty nine percent of them were interested as shown in Table 7.

Table 7: Comparison of Land-use Change for Housing in the Three Regions

	Number of households having already sold their land for housing at the time of survey	Households interested in selling their land for housing
SKR	9 %	11%
QR	8%	14%
NR	0%	0%

Source: Survey 2008

Industry: Some parts of the land in these three regions have been affected by degradation to a degree sufficient to reduce its productivity, because of various industrial activities. The major four industrial options observed in these regions are ceramics, furniture, leather, and rice-processing units. Some landowners have already sold their land for these businesses, and some were interested in selling or starting their own business. Details of this are given in Table 8. Mostly, landowners have a lack of finance and, hence, were interested in rice-processing units, because of the availability of raw material.

Table 8: Comparison of Land-use Change for Industry in the Three Regions

Options	Households interested in industry in			Total
	SKR	QR	NR	
Ceramics Industries	3%	–	–	3%
Furniture Industries	–	1%	–	1%
Leather goods	–	–	4%	4%
Rice-Processing Units	8%	1%	19%	28%
Total	11%	2%	23%	36%

Source: Survey 2008

All those households involved in industrial activity were divided into two categories: (1) already sold or having started their business or (2) interested in this activity (shown in Figure 4). The comparative analysis of three regions shows that the Shaikhupura-Kamoki region is most effected among all the three (Table 4) with a value of eight percent land degradation because of this use. In the other two cases, land is degraded by about six percent in NR and three percent in QR, because of industry as an option of land-use change.

As per the survey results, most of the owners were interested in the business of rice-processing units. Some units had already been established in these regions. These were observed as a major pollutant within the area and not only cause dust and noise in the regions, but also are harmful to the agricultural land of the area. They produce rice-milling dust and soot (produced through the generators of the mills), with exhaust fumes that settle on the crop and land in the nearby agricultural plots; this causes the subsequent land degradation.

Similarly, mineral processes such as the grinding of calcite and soapstone for the ceramic industry produce a huge quantity of dust, which retards the process of the infiltration of water into the soil after settling onto the land (Soil fertility institute, Lahore, Pandey and Singh 2009). This is one of the reasons for land degradation in SKR. In the case of the leather industry, some chemicals are used that

have toxic effect on the health of the soil (Kanagaraj et al. 2006: 541). Therefore, effluents from these industries have become a major source of land pollution in the region NR.

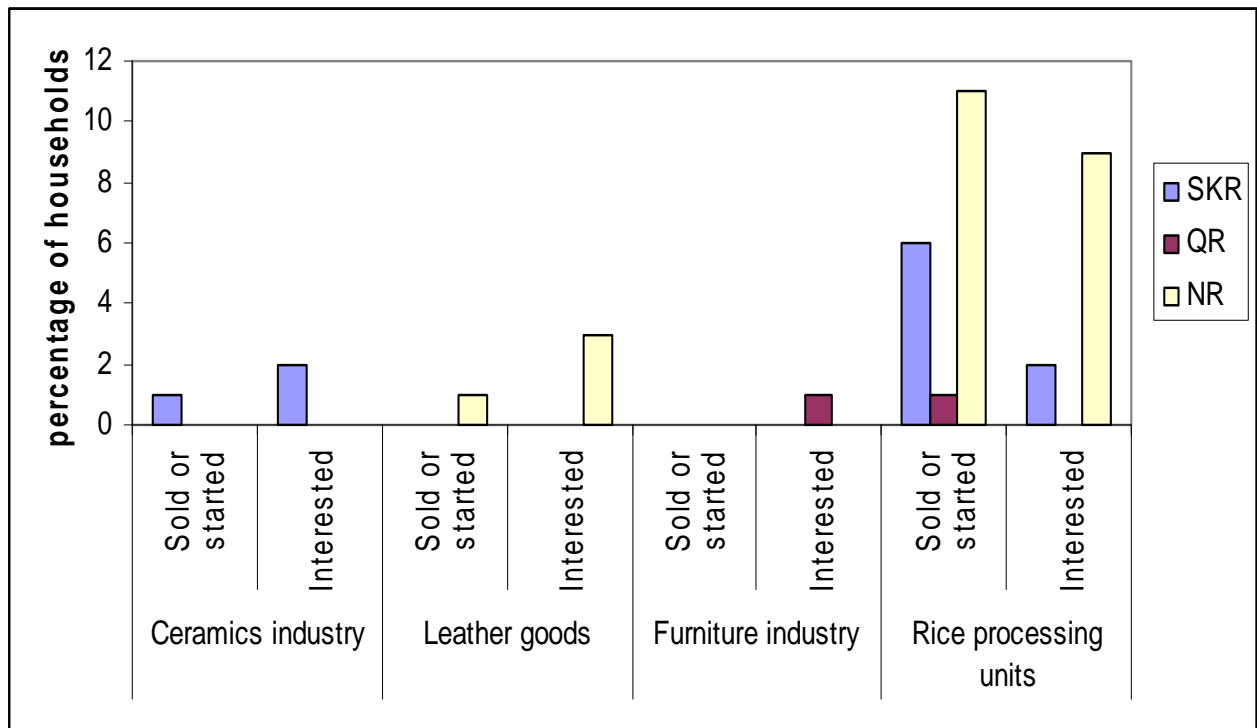


Figure 4: Comparison of Regions regarding Industry as an Option of Land-use Change
 Source: Own Presentation, Survey 2008

Raw material, which is used in the manufacturing of furniture, such as metals and dyes, has an influence on land in the Qadirabad region. Metal contaminants mostly affect the ground water, and metal dust emissions when they settle down onto the land stop the filtration of water into the soil. Similarly, dyes and pigments also have a negative impact on the land (Wilson 2002: 1), as they produced toxic effects on the land and cause a fall in the productivity in QR.

Fish farming is another alternative option of land-use in the case study area of the Qadirabad Dam region, where generally soil suffers with a waterlogging problem. Integration between agriculture and aquaculture as a way of salvaging some productivity from degraded land has been tested by various soil scientists. As a result of this study, fish farming does not have any positive effect on the soil quality and plays a considerable role in the decreasing of the productivity of land (Hamed 2007: 2). Mostly, the fish farmers did not look after their production units and allowed fish waste, drugs, chemicals, and uneaten food to pass into surrounding water resources. This contamination in the water may cause sedimentation (Environmental Defense Fund (EDF) and, hence, the soil becomes less permeable and does not allow water to penetrate deeply, which enhances the problem of

waterlogging in the region. The results show that this option of land-use change is approximately fifteen percent responsible as a cause of waterlogging on land. Currently, twenty four percent of households in QR are engaged in this business, and twenty six are interested in it for future land-use change (Figure 4). The data indicate that, with the increase in this change, more land will become degraded.

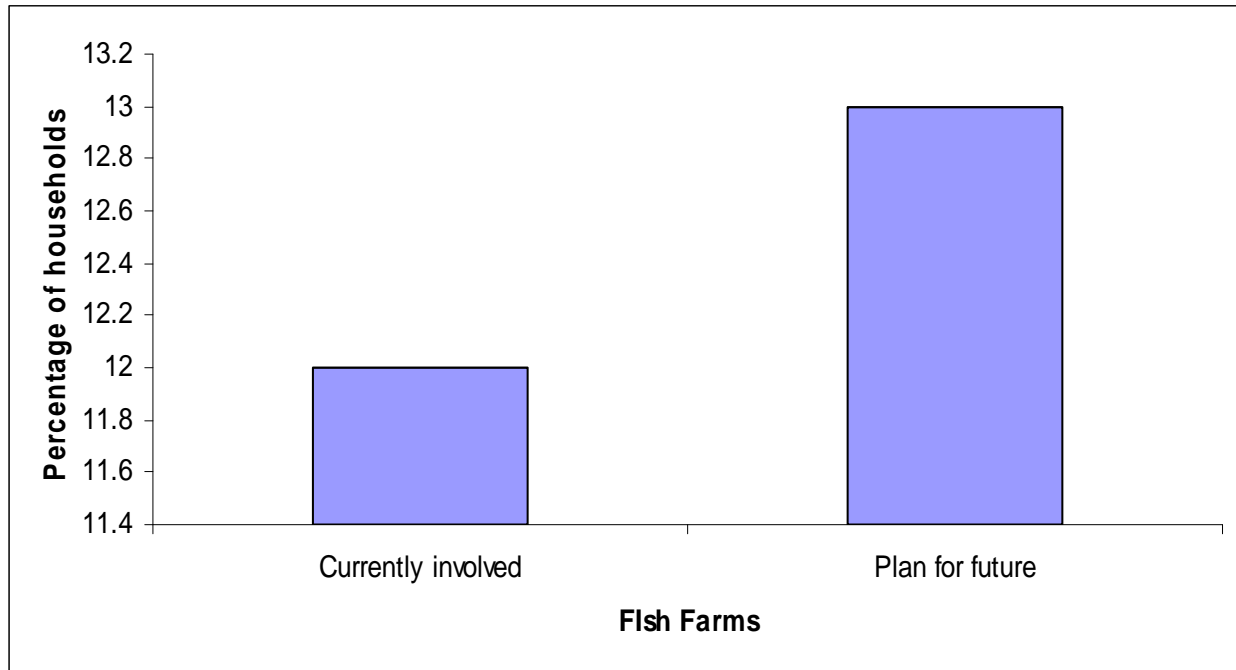


Figure 5: Fish Farms in the Qadirabad Dam Region

Source: Own Presentation, Survey 2008

Government acquisition: The construction of major physical infrastructure such as roads and highways is the responsibility of the government in Pakistan, and for this purpose, the constitution allows that the government can acquire land for public use. Although these changes are essential for the economic growth of the country, these decisions of land acquisition sometimes cause severe damage to agricultural land. As shown in this study, in regions where the government acquired good agricultural land, soil erosion has resulted, and much good agricultural land has lost its productivity.

For the construction of the motor way from Lahore to Islamabad, a vast area of agricultural land was acquired by the government in the region of Shaikhupura-Kamoki, and the local farmers were forced to leave their land with an inadequate amount of compensation. Construction of this motor way caused heavy soil erosion in the region, which affected other land and reduced its productivity. According to the estimated results, nine percent of land degradation has been in response to government acquisition in this region.

Similarly, in the Nandipur region, approximately one percent of land degradation is in response to government acquisition, as here the government acquired land for the installation of electricity poles in the region. In the Qadirabad Dam region, this option was a constant, suggesting that the government had not acquired land in this region.

The land acquisition process was not properly implemented in these regions as stated in the law book. Government officials were influential and, without prior notice of land acquisition, sometimes took land for public use; for example, for the installation of an electricity pole in Mustafabad, the government used the land without the consent of the owner, which caused damage to the ground and other parts of the land also became uncultivable. For the mental torture and financial loss caused, the landowner took the responsible government department to court in 1998; the first court hearing was delayed to 2005, because of the strong bureaucratic power of the concerned department. In this scenario, only six households were interested in allowing their land to be used for public purposes in all three regions (shown in Table 9).

Table 9: Households Interested to Opt for ‘Government Acquisition’

Regions	Number of households
Shaikhupura-Kamoki Region	1
Qadirabad Dam Region	2
Nandipur Region	3

Source: Survey 2008

Poultry farming business is used as an option for land-use change only in the Qadirabad region; in the other two areas, this option was constant and was not possible to estimate for the results. Most of the literature support that poultry manure can be used to increase the productivity of the soil, as it contains organic fertilizers such as nitrogen and phosphorus. However, the results of this study do not agree with this hypothesis and show a positive relationship with land degradation. This land use option has a strong positive relationship with the land degradation, as the value of slope is 28.24, and a measure of responsiveness for this variable is 0.04, i.e., four percent of the land degradation occurred through the poultry business. This may have occurred as a result of the soil condition, which is wet because of the waterlogging problem in the area, and in these types of soils, the spreading of nitrogen-containing material forms highly toxic nitrites, and most of the nitrogen is lost because of the water on the surface (Subrahmanyam 2009: 9; Nnaji et al. 2011: 3).

Hotels and marriage halls: This land use is directly related to the construction of building and reduces the vegetation on the land surface. This causes soil erosion and the loss of many minerals

from the land; for example, in the region QR, this option has been observed, and the agricultural land in the surroundings has lost its productivity in terms of agricultural output.

The geographical location of the areas influences whether this change is a profitable business. Landowners, who had sold their land for this purpose, had their plots near to the grand trunk road between the two big cities, Gujranwala and Gujrat. About two percent of households were involved directly in this business, and six percent had sold their land for it. Another six percent of them showed an interest in this business. The estimated results of the study suggest that this option is insignificant and has no major impact on land degradation in the region. In the case of other two regions, this option was constant.

Compressed natural gas and patrol filling stations: Another option of land-use change was observed in these regions, i.e., ‘fuel filling stations’. While estimating the results for this study, and in order to remove the problem of the collinearity among data, this option was deleted in all cases and was not possible to estimate. These fuel filling stations have underground tanks for the storage of patrol or gas, and these might be responsible for causing contamination by hydrocarbons that might enter the soil beneath the site, with possible toxic effects on the underground water and a reduction in its absorption into the soil. Despite these effects on land, this is an option that increases the return of the landowners, and so in the three areas, some landowners were involved in this business (Table 10).

The results of this study regarding land-use change indicate the lack of a sustainable developmental model for these regions, which causes land degradation and reduces the contribution of agricultural output at the local and national level. Land belongs to the private owner, and they are free to take decisions about the use of it.

Table 10: Comparison of the Three Regions Regarding Land-use Change for Filling Stations

	Number of households already involve in this business		Households interested in selling for filling stations	
	Own Business	Sold	Own interest	Interested in selling
SKR	4 %	0%	6%	2%
QR	4%	0%	2%	2%
NR	0%	0%	0%	0%

Source: Survey 2008

4.3 Conflicts because of Land-use Change

From these results, the trend of landowners is clear: some of them are interested in using land by themselves, and others want to sell. This mainly depends on the returns that they will get from their land. Some conflicts are also related to this decision of the landowners. During the study, two major

reasons for conflicts have been observed. One involves intergenerational land distribution, based on the property rights for the distribution and transfer of land. Other involves land-use implications and based on choice.

To check the effect of these conflicts on land degradation, three different Equations were estimated, one for each region through ordinary least square, as the land-use conflicts and land distribution conflicts were predictor variables, and land degradation was respondent. The results of these Equations are given in Table 11. All these significant and positively related estimates confirm, the conflicts, either based on land use or land distribution, would lead to more land degradation. This is an explanation for an improper implementation of land distribution institutions and the non-existence of the land-use change institutions.

Table 12: Effect of Land-use Change Conflicts and Land Distribution Conflicts on Land Degradation for all Study Regions

Variables	Estimated Coefficients	t values
Results for SKR		
Constant	6.03	1.07
Land-Use Change Conflicts (CLUC)	10.82	1.69***
Intergenerational Land distribution conflicts (Cdis)	13.78	2.92**
Results for QR		
Constant	15.21	3.36**
Land-Use Change Conflicts (CLUC)	11.77	2.16**
Intergenerational Land distribution conflicts (Cdis)	11.92	2.07**
Results for NR		
Constant	4.95	20.52*
Land-Use Change Conflicts (CLUC)	0.59	1.63***
Intergenerational Land distribution conflicts (Cdis)	0.64	1.77***

Source: Field Survey 2008

* Significant at level 0.01

** Significant at level 0.05

*** Significant at level 0.10

From the explanation of these results the hypothesis, “conflicts either related to land distribution or land-use change cause land degradation”, has been proved. The complex situation of the land

ownership and the land-use change because of third party investment generates conflicts affects soil fertility and mentions the degradation of not only of particular land, but also of native land, because of a change in direction of the underground water (Soil fertility research institute, Lahore).

4. Conclusion

The effects of land conversion through different observed options refer to impacts on agricultural productivity generated by the process of destruction and reconstruction and involving alterations in the land parcel and land use. Direct or indirect consequences of human actions, related to land-use change, accelerate the resource loss. In the case of land, this loss is in the form of low production or even a lack of agricultural output.

The value of the effectiveness of agriculture supports the need of agricultural policy for the better utilization of the resources in the region. This policy should help landowners to decide about the use of their land in the way in which they maximize their returns, earn more wealth, and increase their well being. The proper management of the land would be helpful in achieving higher production, which would raise the gross domestic product.

Conflicts related to the inequalities in land distribution and the transfers of land to the actual owner are deep-rooted in structure and have a strong association with the land-use change and alterations on the land. The improper implementation of laws exploits the rural poor, as in case of the damage to land and the loss of returns from agriculture practices. In this chapter, the analysis has established that land is degraded because of these different conflicts, either based on land distribution or based the land-use changes in the study regions. Strong local governance may be helpful to resolve these conflicts, so as these representatives would guide the landowners with regard to better land-use decisions, which would be favorable to the landowners, and they would earn more profit in a much better way. These decisions would also be beneficial for the country's economy.

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