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GEO-SPATIAL ANALYSIS: THE IMPACTS OF LAND POLICY ON THE DEVELOPMENT OF CHOLISTAN DESERT REGION, PAKISTAN

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ABSTRACT

The Cholistan desert region has the potential of agro-pastoral husbandry development with limited natural resources. The Government guided this developmental process through land allotment policy which has different implementation modality each time. The land policy has diverse impacts on the arid and semi-arid regions of the Cholistan desert. The impacts of policy on the socioeconomic conditions of the regions are associated with geo-spatial techniques. The sample settlement is geo-coded, and their responses are combined into two regions i.e. Lesser and Greater Cholistan regions. The combined responses are associated through phi coefficient and Cramér's V. The impacts of land policy in the Lesser Cholistan region are encouraging the developmental process while in Greater Cholistan, it discourages the development with poor socioeconomic conditions. The present study provide opportunity for understanding, mode of implementation and modification in land policy to achieve sustainable development.

1. INTRODUCTION

The Cholistan Desert is spreads over 26100 Sq. Km in the southern Punjab. It is a typical hot desert of Pakistan. The Cholistan desert area comprises on partly areas of three districts i.e. Rahim Yar Khan, Bahawalpur, and Bahawalnagar. The residents of Cholistan Desert are practicing the agro-husbandry and most of the secondary economic activities are directly dependent on this primary activity. This primary activity is directly dependent on the scare natural resources of the region particularly land and water. In 4000-1000 BC, this area was a fertile and populated area when the Hakra River flowed through it. In around 600 BC, the river and its tributaries changed their course. Consequently, the river dried up and an unbearably harsh environment forced the people to migrate. As a result, the settlement began to disappear. The old bed of the Hakra River still shows the remains of a series of decayed forts which were established for the security purpose (Ahmad 2011, Wariss, Mukhtar et al. 2013, Khan and Khan 2015, Shahid, Shafique et al. 2016). Presently, the permanent settlements are concentrated in the Lesser Cholistan due to favorable ecological conditions. In the Greater Cholistan region, the population and their settlements are sparsely distributed around water availability in forms of "*Tobas"*. Settlements are generally still near water bodies (Geyh and Ploethner 1995, Akbar, Khan et al. 1996, Shahid, Shafique et al. 2016, Malik and Ali 2017, Arshad, Iqbal et al. 2018).

Likewise, the other hot and arid desert of the world, the climate of the Cholistan is highly hostile with frequent droughts and high temperatures. The average rainfall during the last ten years did not exceeded 185 mm. The irregular distribution of this rainfall sometimes makes the availability of water and vegetation very scanty. The increase in livestock population of Cholistan increases the pressure on the rangelands which forced the local nomads' population to migrate toward irrigated. In the Lesser Cholistan region, change is very rapid due to availability of irrigated land (Rajani and Rajawat 2011, Wariss, Mukhtar et al. 2013, Malik and Ali 2017, Arshad, Iqbal et al. 2018). The Government instrumented this change with the land policy which has greater implications on the development of this region. It is obvious that a rational, innocuous and wide-ranging right to use the resources of land is guaranteed in a land policy. It is the land policy that describe rules and regulations for land management, tenancy and occupancy as well as conflict resolving mechanism for all associated issues. The Cholistan Desert; Cholistan Development Authority and Revenue Board Punjab regulate the land policy in the Cholistan Desert region (Malik, Ali et al. , Akbar, Khan et al. 1996, Bainbridge 2012, Settle 2012, Zhao, Chen et al. 2013).

The present study is an attempt to understand the land policies implemented by Government from time to time and their implications on the development of Cholistan Desert. Based on climatic and socioeconomic conditions, Cholistan desert can be detached into two distinctive regions of Greater and Lesser Cholistan (Farooq, Samad et al. 2010, Hameed, Ashraf et al. 2011, Malik and Ali 2017). Most of the land policies are operated in Lesser Cholistan region due to availability of irrigated land in their peripheries. However, the residents of Cholistan "Cholistani" considered land and water resources as a collective form of their integrity and sharing these resources with outsource directly affected their socioeconomic conditions. Each and every land policy provides opportunities and threats for their development. These opportunities and threats are Geo-spatially dynamic. Each location perceives the implications of a policy differently and same is with their result on the development. The implications of land policies are studied with Geo-spatial dynamics. Based on the implications of land policy, the share of land, their perception, policy interaction and impacts on socioeconomic condition are analyzed with Geo-spatial technique. The effects of land policy are combined into major regions. The results of impacts and socioeconomic condition are verified through statistical association. In nutshell, the Lesser Cholistan region is prospering and Greater Cholistan region is in depression due to impacts of land policies.

2. DATA & RESEARCH METHODS

The present study is conducted in four major research steps. In the first step of research method, the variables, sampling method and sites for the study are defined. In the second step, the research data was collected through field survey and secondary sources. The collected data was Geo-spatially coded in the form of attributes tables in Arc GIS 10.3 version which was Geo-spatially analyzed and presented on maps in the third step of the study. In the final step of the research methodology, the association of impacts of land policy is verified through statistical techniques. The area Cholistan Desert Region comprise on the areas of Bahawalpur division. Specifically, the areas of 5, 8 and 1 Qanoongo Halqa from three districts of i.e. Rahim Yar Khan, Bahawalpur and Bahawal Nagar, respectively. The two regions of Cholistan Desert are Greater Cholistan which is a hot sandy region and the Lesser Cholistan which is a semi-arid region. The pattern of population distribution is almost contrast with least population in Greater Cholistan which are residing mostly in Tobas while more than 70% of the total share of population is absorbed by the Lesser Cholistan. Based on the population distribution, with sample size of 3% of the total population, one thousand semi-structured questionnaire survey was conducted in 30 settlements. Based on the stratified random sampling techniques, 21 settlements from Lesser Cholistan and 09 settlement from Greater Cholistan were selected to represent the population with 70 and 30% proportion of the total selected population, respectively.

The primary and secondary data was synchronized for the variables of policy status, land share of each household, perception about the role of policy, impacts of land policy on the household and/or settlement, development and socioeconomic conditions. All selected settlements are Geo-coded in Arc GIS and these variables data are attached with the attributes table. Based on the Weighted Overlay tool in ArcGIS, most of the data is converted to percentage share at each location with the equal weightage for all settlements in the analysis. Using the Arc GIS tool of Spatial Analyst, the attributes data was analyzed and converted to graphs and tables. The Arc GIS has the capabilities to convert small region into larger through Geo-processing tools. The Geo-spatial responses of selected settlements are combined into major regions of the study. The results are presented in the form of maps for simplification and better understanding. These results are further verified through statistical techniques of phi coefficient (φr) and Cramér's V (φc) (Equation 1 & 2)

$$\varphi r = \frac{x^2}{n} \quad \text{..... (1)}$$

$$x^2 = \sum_{i.j} \frac{\left(nij - {ni.nj}/{n}\right)2}{{ni.nj}/{n}}$$

$$\varphi c = \sqrt{\frac{\varphi^2}{\min\ (k-1, r-1)}} \quad \text{.....(2)}$$

Whereas: φr = coefficient; x2 = Pearson's chi-squared test; φv = V; n is the total frequecy; k = columns as well as = rows. (0.00 = no relationship while 1.00 = perfect relationship)

3. LAND POLICIES

In the Cholistan desert, policy and program interventions were introduced to help the local residents for combating aridity and harsh environment in the region. The sole purpose of these activities are the uplifting of

socioeconomic conditions and sustainable development. The Cholistan Development Authority (CDA) and Revenue Board of Punjab draft and implement the land policies for the peasants of Rohi (Cholistan). The "Shikargah" of the Ameer of Bahawalpur is being used as pastureland. The people of Cholistan Desert have no de jure rights but are using with de facto rights (De jure denote "in law" and de facto denote to "in practice"). De jure lands are not controlled and administrated according to land act and regulation. These lands are kept free and in fact no any managerial authority claims its rights and by and large called an open access area. As such circumstances there are no specific bundle of rights and particular rules to prohibit or eliminate anyone. Everybody can use the resources or land conditionally. Like these resources are mostly exploited rapidly. The CDA has implemented most of the land policies in Cholistan region at different times. The rules and regulation are always modified and updated by the guidance of Government of Punjab (Table 1).

Table 1. Details of land policies in Cholistan dessert

Year	Name	No. of Beneficiaries	Area (Acres)
1950-51	Shahi Muzarian	170	8500
1959-60	Grow More Scheme	2091	31041
1970-71	20-years temporary Cultivation	2038	25475
1977-78	15-year temporary Cultivation	11598	144112
2000	5-year temporary Cultivation	4556	57075
2005	Allotment Balloting 1983	245	3063
2002	Kargal: Army Welfare Scheme	133	2390
2010	Agri Graduate Scheme	05	100
Total		20846	271461

Source: Modified after (Malik 2019)

The total area allotted under all land policies are 271461 acres in Cholistan region. Most of them are local residents and utilized as economic opportunity for their own development. The field data revealed that most of the residents possess 11-20 Acre land through these policies. The higher number and large areas are allotted in big settlements like Derawar, Ladam Sar and Islamgarh etc. The interaction of the residents and land policy are assessed through criteria of land allotment (policy) which beneficiated them. The criteria of land allotment (policy) are practiced in the past are: each Pakistani, each Cholistani, tax payer (Tirini-guzar) and voter list. Each Cholistani criteria of land allotment is the most beneficiated for the residents of Cholistan. The pattern of assessment was almost the same of land size (11-20 Acre), which confirm their interaction with land policy (Fig. 1).

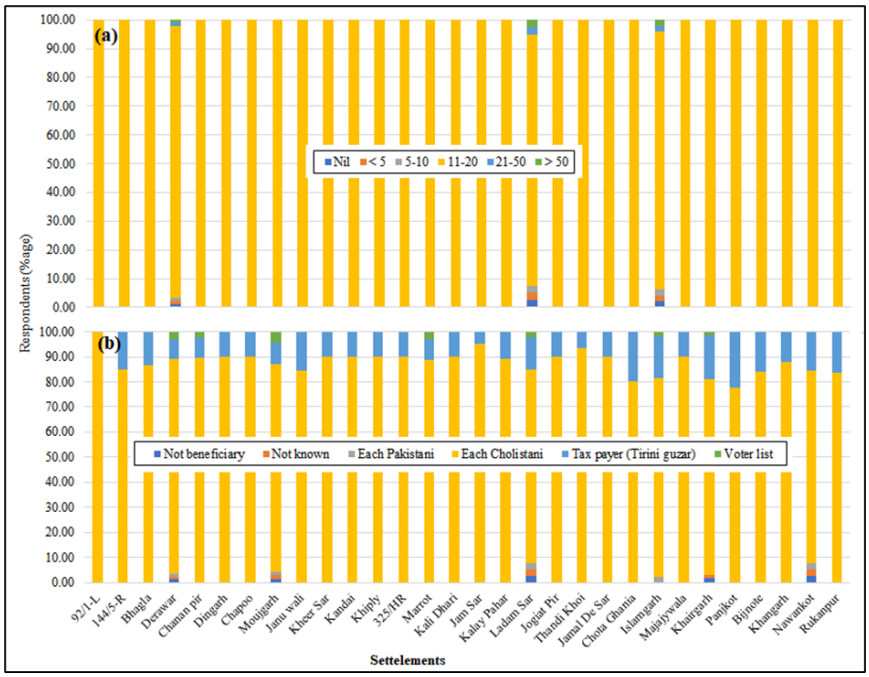

Fig. 1. Land Policy: (a) Land Allotted (in Acre); (b) Beneficiaries from the type of Policy

Source: Field Survey Data, 2017

4. DEVELOPMENT

The economy of the Cholistan Desert is totally depending on the agro-husbandry which is called white gold, now a days. In this desert region, livestock and cattle are source of income and food as well as social status. In Cholistan Desert region, the agro-husbandry system of production is practiced in which people own land allotments in irrigated-fed areas of Lesser Cholistan. The tribal system of *biradaries* govern the social, political and economic system in this desert area of the Pakistan. For more than a century, the *wasoon (numberdar)* of each settlement is the link between various Line Agencies and local communities *(biradaries)*. These *numerberdars* work as a tax collector. The tax is called "*trini*" (per livestock tax). The annual current rate is Rs.18, 12, 6, and 3 for camel, Buffalo, cow/cattle and sheep/goat, respectively. In Cholistan Desert, the people domesticate the livestock for multi-purpose, which can help to improve living conditions in the desert region of the Pakistan. The natural resources particularly of land rights are susceptible to ethnically and politically interventions. A common term of land mafia is outsider as well local land grabbers. There are always few checks to avoid exploitation but no policy has the capacity to discourage outsiders and investors. Unanimous view was found regarding the policy implementation in the study area (Figure 02).

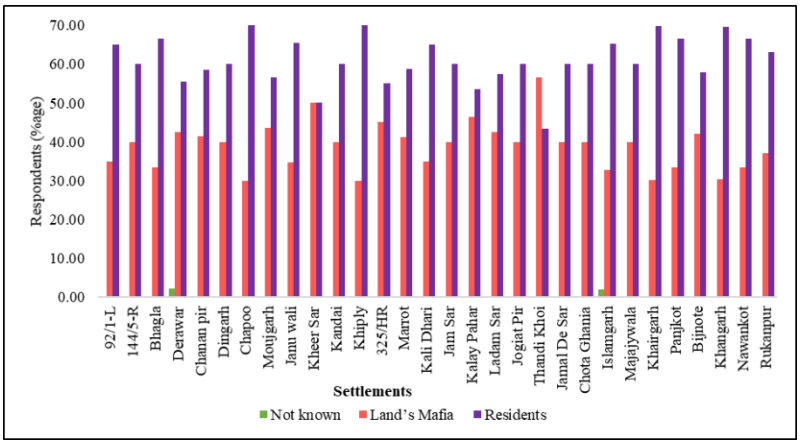

Fig. 1. Perception regarding Beneficiaries from the land Policies

Source: Field Survey Data, 2017

The socioeconomic indicators of welfare which differentiating groups and regions with reference to development are well perceived by the residents of Cholistan Desert. Based on the analysis, it is obvious that the region of Lesser Cholistan is well developed as compare to Greater Cholistan which are reflected in their socioeconomic conditions as well. The land policies impact on the development in Cholistan Desert region is analyzed through poverty, no change and improvements. The Geo-spatial analysis show that settlements located in Lesser Cholistan region has very positive and cumulative response regarding the improvements in socioeconomic conditions and overall development. However, the Greater Cholistan region has total contrast conditions regarding development. These cumulative responses are grouped into region in GIS platform and give a conclusive result of the relationship between the land policies impact on the development in Cholistan Desert region (Figure 03). The high association values of statistical analysis of Phi = 0.804 and Cramer's V = 0.804 further verified the results of this Geo-spatial analysis. The contrast results of the land policy implication on development are directly linked with regional analysis. It is pertinent to note that all policies allotted land in the Lesser Cholistan region for all Cholistanies. However, the local residents are well adopted for the opportunities and threats from the implementation of these land policies. While the residents of Greater Cholistan were least beneficiated from these policies due to their location and accessibility.

Table 2. Impacts of policies on the Development in Cholistan Dessert

Region	Poverty	No change	Improvements	Total
Lesser Cholistan	42	66	592	700
Greater Cholistan	208	91	1	300
Total	250	157	593	1000
Phi = 0.804			Cramer's V = 0.804	

Source: Field Survey Data, 2017

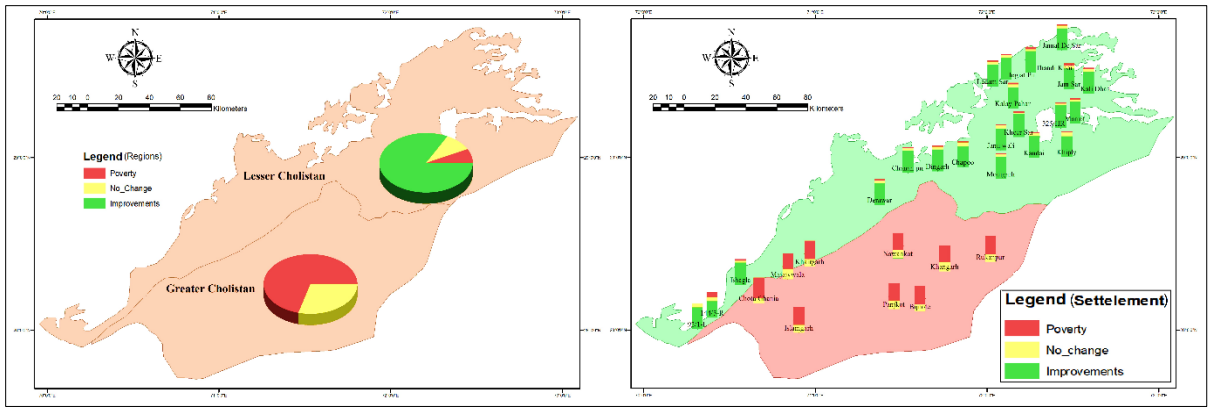

Fig.3. Impacts of land Policies on the Development in Cholistan, Pakistan

Source: Field Survey Data, 2017

5. CONCLUSIONS

Cholistan is the hottest and dry desert region of Pakistan with scare natural resources of water, land and vegetation. The economy is based on agro-husbandry activities with tribal social system. The land policy is major instrument for development and targeted socioeconomic changes. After independence, eight different land policies are implemented in the region of Cholistan for development. On the basis of aridity, water availability and old Hakra River, the Cholistan Desert region is divided into Lesser and Greater Cholistan. Although, the whole region practiced the tribal system for social, economic and common property resources management. However, the Lesser Cholistan is more developed as compare to Greater Cholistan. Th Geo-spatial analysis of the impacts of land policy shows that both regions are equally beneficiated from these policies with similar perception regarding land grabbing and land mafia. The household conditions and responses are combined at the settlement level and then converted to regional level. Improvement in development and socioeconomic conditions are reported by more than 70% respondents in the Lesser Cholistan region at the settlement level. Almost, the same level of poverty was recorded in the Greater Cholistan region. The regional values showed same relationship of policy and development. More than 0.8 values of Phi Coefficient and Cramer V for association analysis of policy impacts on development shows the high level of dependency and as well as accuracy. The socioeconomic condition in the Lesser Cholistan are well-off while in contrast poverty prevails in Greater Cholistan. The most important factor for this discrepancy in development are land policies. The residents of Lesser Cholistan avail the opportunities offered by land policies and adopted with threats with passage of time. The residents of Greater Cholistan could not comprehend the threat of land policies and gradually lost their land in the Lesser Cholistan which was crucial for their survival. The modifications in future land policies are urgently required to upheld the needs of the Greater Cholistan. The land policy with opportunities for development in Greater Cholistan will enhance the chances of sustainable development in the region.

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