

EVALUATION OF URBAN ENCROACHMENT ON FARMLAND: A THREAT TO URBAN AGRICULTURE IN PESHAWAR CITY DISTRICT, PAKISTAN

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With 7 figures and 8 tables

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Summary: Peshawar is the capital city of Khyber Pakhtunkhwa (Pakistan) and the largest urban center in the province. The city is experiencing rapid urban growth which is not without its impact on urban agriculture. This paper traces the developments in the conditions of farmland in the district during the last two decades. With increasing population and economic activities, land demand for housing and other nonfarm uses like industries, commercial and transport is rising. The built-up area is expanding in all directions around the city, which is the best agricultural land except along its western side that is barren land. Therefore, any expansion in built environment has resulted and is resulting in diminishing farmland. This paper analyzes how farmland has been engulfed by nonfarm uses in the process of urban expansion. An interesting fact in the case of Peshawar is that while agricultural land is being lost, some new agricultural land is also being gained. In 1991 agricultural land constituted 41 percent of the total land area of the city, which increased to about 58 percent in 1997. Nevertheless, an analysis of the land capability classes indicates that most of the gain in farmland has been in inferior class IV category, which is low in productivity while encroachment of built up area has been over the most fertile and highly productive class I category. The paper while analyzing the encroachment process also explores the policy options that are available to preserve the remaining farmland by making urban agriculture more profitable and incorporating the activity in the city plans for implementation.

Zusammenfassung: Peshawar ist die Hauptstadt von Khyber Pakhtunkhwa (Pakistan) und das größte städtische Zentrum der Provinz. Die Stadt erlebt ein schnelles Stadtwachstum, das nicht ohne Auswirkungen auf die städtische Landwirtschaft bleibt. Diese Studie zeichnet die Entwicklung der letzten beiden Jahrzehnte nach und analysiert die veränderten Bedingungen für landwirtschaftliche Nutzung im Stadtbezirk. Mit zunehmender Bevölkerung und Wirtschaftstätigkeit steigt die Flächen nachfrage nach Wohnraum und anderen nicht landwirtschaftlichen Nutzungen wie Industrie, Gewerbe und Verkehr. Das bebauten Gebiet dehnt sich in alle Richtungen um die Stadt herum aus und erfasst dabei (abgesehen von dem kargen Land im Westen der Stadt) die besten landwirtschaftlichen Flächen. Daher führte und führt jede Erweiterung der bebauten Umwelt zu einer Verringerung der Anbauflächen. Eine interessante Feststellung im Falle von Peshawar ist, dass auf der einen Seite landwirtschaftliche Flächen verloren gingen, aber im Gegenzug andere Areal der Landwirtschaft zugeführt wurden. 1991 machten landwirtschaftliche Flächen 41 Prozent der Gesamtfläche der Stadt aus; der Anteil stieg bis die 1997 sogar auf rund 58 Prozent an und stagniert seitdem auf diesem Niveau. Eine genaue Analyse zeigt jedoch, dass der größte Teil des Zuwachses an Ackerland auf minderwertigen Böden erfolgt, während der Urbanisierung die fruchtbarsten Flächen zum Opfer fallen. Vor diesem Hintergrund werden gesellschaftlichen Optionen und politischen und planungsrechtlichen Rahmenbedingungen aufgezeigt und im Kontext einer nachhaltigen Entwicklung landwirtschaftlicher Nutzung im Stadtgebiet diskutiert.

Keywords: urban farming, nonfarm uses, cultivable waste, land capability, land use, urbanization, urban planning

1 Introduction

Urban farming is generally considered as an activity that involves food or agricultural production within or fringe of cities and is practiced by people with varied motivations and different socio-economic backgrounds (MOUGEOT 2006; FAO 2007; DUZZÍ et al. 2014; SIMON-ROJO et al. 2015). It is very common and of considerable importance in both developed and developing countries particularly in providing food as well as jobs (DE BON et al. 2010). According to a Green Biz online

publication, one fifth of the World's food is produced in the urban farms (ROYTE 2015). Likewise, UNDP (1996) estimated that, about 200 million people were either directly employed in urban farming or engaged in related activities at the turn of the century, contributing to the food supply of over 800 million urban dwellers. However, due to rapid urbanization and resulting expansion of built up area, there has been a gradual decline of farmland in most of the rapidly growing cities around the world (HALLETT 2016; LONG et al. 2018; MARTELLOZZO 2018)

Urban agriculture also offers many other benefits to cities and their residents. From an economic point of view, it helps supplement household income, which enables monetary savings. Socially, it provides a sense of community and improves the nutrition of women and youth by generating additional food. Environmentally, it helps in reuse of wastewater and organic solid waste, reduces use of fertilizers and pesticides, and makes cities more resilient to climate change (WORLD BANK 2013). However, despite its growing importance, urban agriculture is under tremendous pressure from expanding built up area in the form of urban sprawl, which is jeopardizing its sustainability (JIANG et al. 2013). D'AMOUR et al (2017) have warned against the serious consequences of urban sprawl over the global cropland. According to them, in the near future, the continents of Asia and Africa will experience the highest absolute loss in cropland and much of this loss will be of prime agricultural land (producing twice as much as that, which comes from the average national land).

Several scholars and organizations have worked on urban agriculture both in developing and developed world (KROGMANN 2003; ORSINI et al 2013; ALTARAWNEH 2014; HAMILTON et al. 2014; BADAMI and RAMANKUTTY 2015; DIMITRI et al. 2016; OPITZ et al 2016, AHMAD et al 2017; BATTERSBY 2017; HORST et al. 2017; MARTIN and WAGNER 2018). These studies have covered numerous issues including:

- the analysis of pattern of urban sprawl and engulfment of agricultural land;
- the study of factors responsible for urban encroachment on agricultural land,
- simulation for predicting future of urban farmland on the basis of past trends,
- the study of consequences of the loss of agricultural land particularly its impact on food security,
- the policy options and planning measures available to check the adverse consequence of urban encroachment on agricultural land.

The policy options and planning measures available to check the adverse consequence of urban encroachment on agricultural land constitute one of the most important and relevant aspect that has been a subject of many studies (GREENHOW 1994; MOUGEOT 2006; ANH 2007; LOVELL 2010; CHATURVEDI and SARKAR 2012; LADNER 2013; ISMAIL 2015; CINA and KHATAMI 2017; DIELEMAN 2017). International Organizations like FAO (2001, 2007) have also advocated for making urban farming an important constituent of city development plans. In one of the latest

studies, FUDJUMDJUM et al. (2019) worked on barriers that inhibit integration of urban agriculture in the city plans of Nigeria. They argued that by framing integrative policies, urban farming can successfully supplement food for the urban dwellers in several cities. A WORLD BANK (2013) study while examining the contribution of urban agriculture to livelihoods, food security and health, in four selected cities also concluded that the integration of urban agriculture into development strategies and policy decisions is important for its long-term sustainability. In fact, there are many urban centers in the world where urban farming has already been incorporated in urban plans (FAO 2001) for example in Latin America, such cities include Rosario and Cienfuegos (SCHWAB et al. 2018); in Africa Dar es Salaam in Tanzania, and Nairobi and Kampala in Kenya (GORE 2018) and in Asia, Cagayan de Oro in Philippines (HOLMER and DRESCHER 2005). These plans are important in the sense that they provide guidelines to other cities towards integrating or incorporating urban farming into their city or metropolitan plans (LADNER 2013). The trend of integrating farming in urban land uses has not only been carried out in developing but also in developed world. For instance, in Seattle, USA, the authorities have planned to grow edible forest in the region of Beacon Hill (NAPAWAN 2015).

Like other developing countries, urban farming occupies a large area within the city and urban fringe in Pakistan. However, growing urban sprawl is fast encroaching the land under agriculture (KHAN et al. 2012; YAR et al. 2016). According to one estimate, based on the analysis of satellite images, the urban sprawl in Pakistan encroached upon 77,000 hectares of agricultural land between 2000 and 2010 - most of this was prime agricultural land (GoP and UP 2014). This poses a growing threat to food security and demands a systematic study of the phenomenon to control it. Unfortunately, so far, urban farming has not been a well-studied subject in Pakistan and the literature available (ARSHAD et al. 2017; PEERZADO et al. 2018) on the same is scanty. This case study on Peshawar City District in relation to urban agriculture is one of the pioneer works, which hopefully would provide stimulus for more studies in future. The research focuses first on the characteristics of urban agriculture and examining the dynamics of spatial change in farming land. It then investigates the factors that are responsible for urban encroachment on agricultural land and finally, it explores the policy and planning implications of such change and how it can be controlled and steered in the right direction.

2 Material and methods

A central component of the study was the detection of land-use and land-cover change between 1991 and 2012. To improve the quality of the results, different data sources were used. Since only LANDSAT satellite data with a low resolution (30m) were available for 1991, the land use classification was supported by the digitization of topographic maps (scale: 1:50,000 from Survey of Pakistan) and land survey data. The classification for 2012 was essentially based on SPOT-5 data with a spatial resolution of 2.5 meters (obtained from the Space and Upper Atmosphere Research Commission (SUPARCO) of Pakistan). Land use data collected from revenue department were used to compare and validate the land uses obtained from satellite images. Based on the land use data for the two years, urbanization and general land use changes were analyzed and quantified with the ArcGIS software. A further comparison with land value data and official revenue records aimed at demonstrating the effects of urbanization on high-quality farmland and thus changes in production conditions.

With a view to the causes of urbanization and the associated effects on urban farming, an evaluation of population development, income conditions, land and real estate prices as well as yield opportunities for agricultural products was carried out. The farmers' point of view was examined in a focused group

discussion with smallholder farmers from Peshawar City District to obtain first-hand information on the reasons, which were inducing farmers to sell their lands to real estate agents and builders. An overview of the procedure is presented in Fig. 1 and the most important data bases are listed in Tab. 1.

3 Results

The results of the study have been outlined in three sections; a general picture of contemporary land use is given in the first section; change or transformation urban agricultural land between 1991 and 2012 has been presented in the next section. The third section shows the pattern or dynamics of conversion of agricultural land to other land uses i.e. what kind of land uses encroached upon agricultural land.

3.1 Contemporary land use and urban farming

Contemporary land use in Peshawar is shown in accompanying map (Fig. 2) which, clearly brings forth the dominance of agriculture, whereby cultivated land occupies over half (57%) area of the city district. Farmland spreads around the core built up area in all directions – in the north and east, it is canal irrigated, while in the south, it is rainfed.

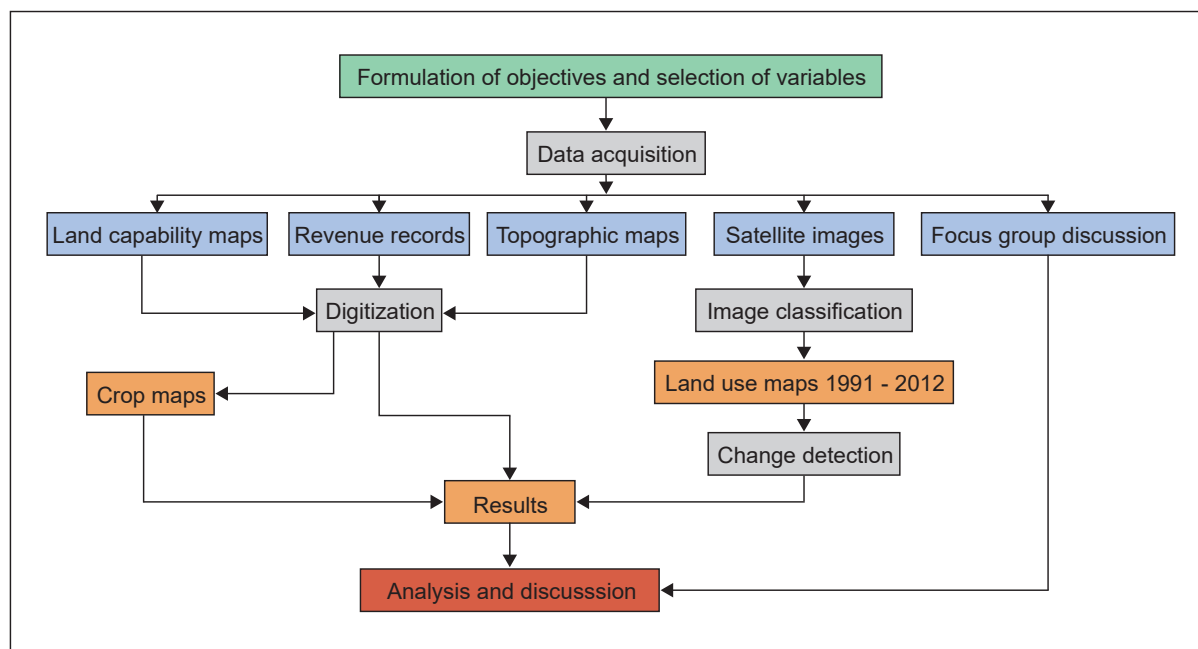


Fig. 1: Research methodology and workflow

Tab. 1: Main data sources and their use

Satellite images	Revenue record	Topographic maps	City Plans	Soil survey records
1991: Landsat TM 30 m: used for land use classification in combination with revenue and topographic maps.	1. Land use data for various dates in the form of revenue maps/ data	Used for digitization of baseline information like rivers, roads, canals as well as mosaic of city district boundary etc. and to identify land use for 1991 in combination with satellite data and revenue maps	To extract planning maps and information on local planning authorities' efforts on controlling growth	To obtain land capability maps and information on the quality of land engulfed by built up area
2012: SPOT-5 2.5m: used for land use classification in combination with revenue maps and data	2. Crop data - quantitative data/ maps 3. Land value data			

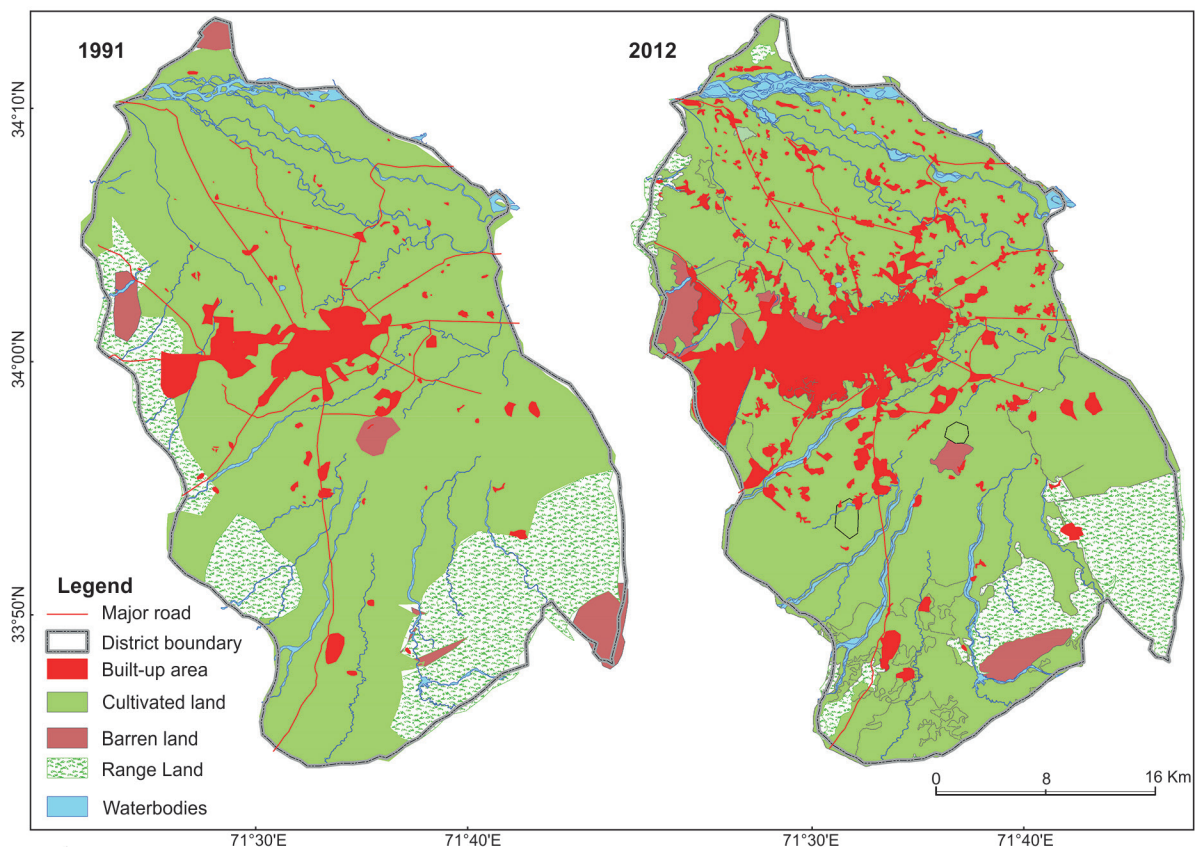


Fig. 2: Peshawar City District land cover 1991 (left) and 2012 (right)

The revenue data also identifies substantial cultivable waste (area once cultivated but currently lying waste) or barren land (substantial part of it can be brought under cultivation, subject to removal of some deficiency – i.e. availability of water). A considerable area in the southern part of the district is rangeland.

3.2 Farmland transformation 1991-2012

The case of farmland transformation in Peshawar is somewhat different from other cities in the sense that it has been both losing and gaining farmland simultaneously (cf. Fig. 2) with overall net gain in farmland in the study period

(1991-2012). Other studies on dynamics of urban farmland show that cities in both developed (BRANDON 2001; NOSOWITZ 2018) and developing countries (LU et al. 2005; QUASEM 2011; AZADI 2011) have witnessed only net loss in agricultural land. Nevertheless, it is important to note that the farmland lost in Peshawar was the prime agricultural land while the land gained was only the lower class farmland. Out of 11,193 hectares arable land lost between 1991 and 2012, 8,456 hectares were most productive in terms of quality (Class I), 461 hectares were from Class II and 410 hectares from Class III. These three categories constituted prime agricultural land with little or no limitation.

Only 246 hectares of marginally cultivable Class IV land was lost to urban uses (Fig. 3 and Tab. 2). Moreover, it is also important to note that the net gain in agricultural land occurred primarily in the early study period from 1991 to 1997 and reached its plateau at around 74,000 hectares in 1997 (Fig. 4 and Tab. 3). Since then it has started shrinking in size gradually. It is important to note that farmland increase was primarily due to extension in irrigation. The rate of increase in irrigated land was faster than the rainfed land (Tab. 4). Since 1991, rain fed area has fluctuated several times due to fluctuation in rainfall. During the years of better rainfall larger area was cultivated.

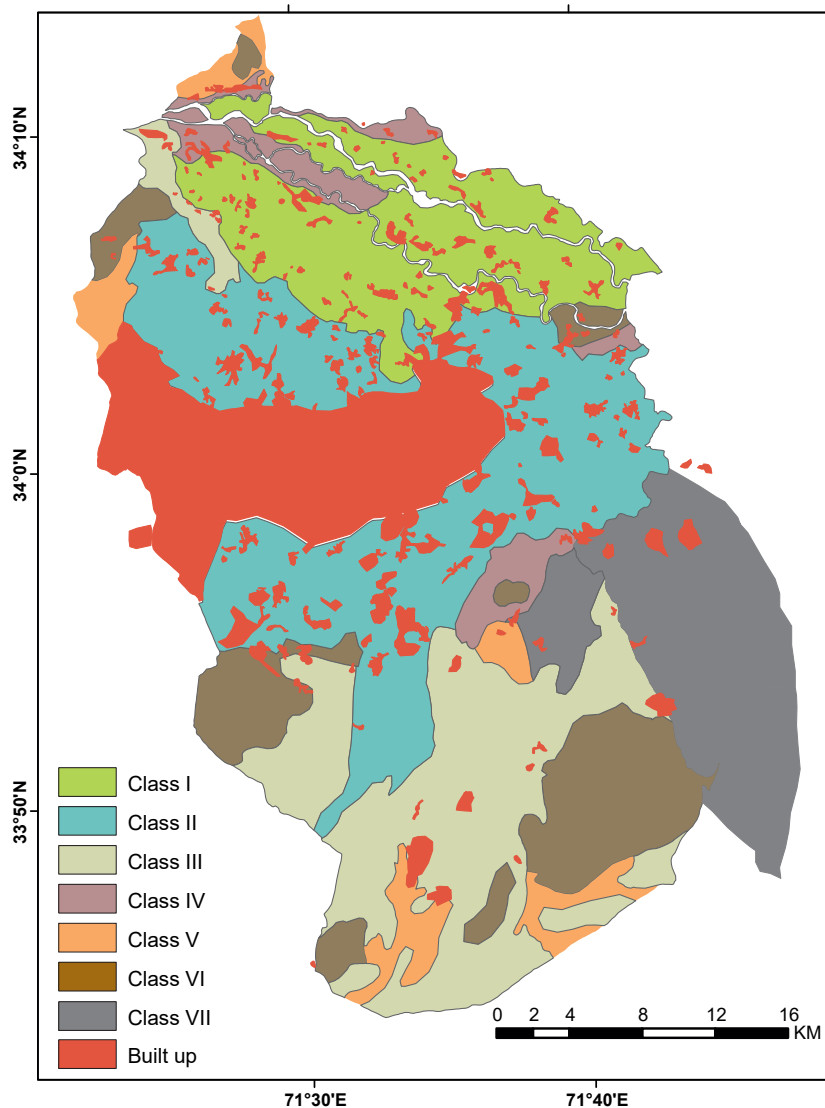


Fig. 3: Peshawar City District: built up area in relation to land capability. Source: GoP 2012b.

Tab. 2: Loss of agricultural land in Peshawar City District by land capability classes between 1991 and 2012.

Land capability class	Farmland lost [ha]	Share [%]
Class I (best quality)	8456	76
Class II	461	4
Class III	410	4
Class IV	246	2
Class VII (worst quality)	1620	14
Total	11,193	100

Source: GoP 2007; SPOT Image 2012; GoKP 2012b.

was developed on nonagricultural land and the rest encroached upon agricultural land, which means that nearly 90 percent of the new dwelling units developed over farmland. After residential use, the second largest consumer of farmland were the brickyards, which basically caters to housing development. Although manufacturing of bricks is part of industrial land use, it has been singled out here to emphasize its dominance over other industrial processes. Area of brickyards enhanced from 970 ha in 1991 to 2,360 ha in 2012, adding some 1,390-ha new area, a major part of which, 1,120 ha came from farmland. Area under other industries

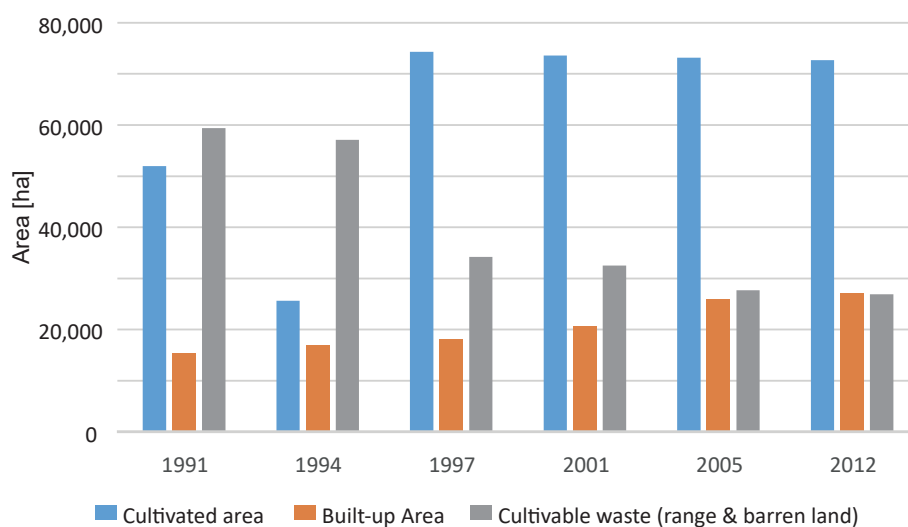


Fig. 4: Peshawar City District: trends in availability of farm land. Source: GoKP 1991-2012a.

Tab. 3: Conversion of farmland 1991-2012

Land Type	1991		1994		1997		2001		2005		2012	
	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%
Cultivated area	51,957	41.0	52,632	41.6	74,315	58.7	73,612	58.1	73,139	57.7	72,712	57.4
Built-up area	15,377	12.1	16,998	13.4	18,205	14.3	20,598	16.3	25,892	20.4	27,126	21.4
Cultivable waste	59,376	46.9	57,080	45.0	34,190	27.0	32,500	25.6	27,679	21.9	26,872	21.2
Total	126,710	100	126,710	100	126,710	100	126,710	100	126,710	100	126,710	100

Source: GoKP 1991-2012a; SPOT Image 2012.

3.3 Pattern of land use conversion

The spatial pattern of these changes are illustrated in Fig. 5. A major part of farmland was transformed to residential land use. Overall residential area consumed 8,748 ha land during 1991 - 2012 period. Out of this, only 1,105 ha of inhabited area

augmented by 60 ha over farmland. Some 271 ha of farmland was consumed by commercial land uses. Only 73 hectares of existing residential land was replaced for this purpose meaning that 79% of commercial expansion took place over agricultural land mostly along the new ring road as well as along arterial roads.

Tab. 4: Irrigated vs. non-irrigated land 1991-2012

Land type	1991		1994		1997		2001		2005		2012	
	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%	area [ha]	%
Irrigated land	47,915	92.2	46,902	89.1	66203	89	70,947	96.4	70,039	95.8	69,153	95.1
Rainfed (Dry Farming)	4,042	7.8	5,730	10.9	8,112	11	3,665	3.6	3,100	4.2	3,559	4.9
Total	51,957	100	52,632	100	74,315	100	73,612	100	73,139	100	72,712	100

Source: GoKP: 1991-2012a; SPOT Image 2012

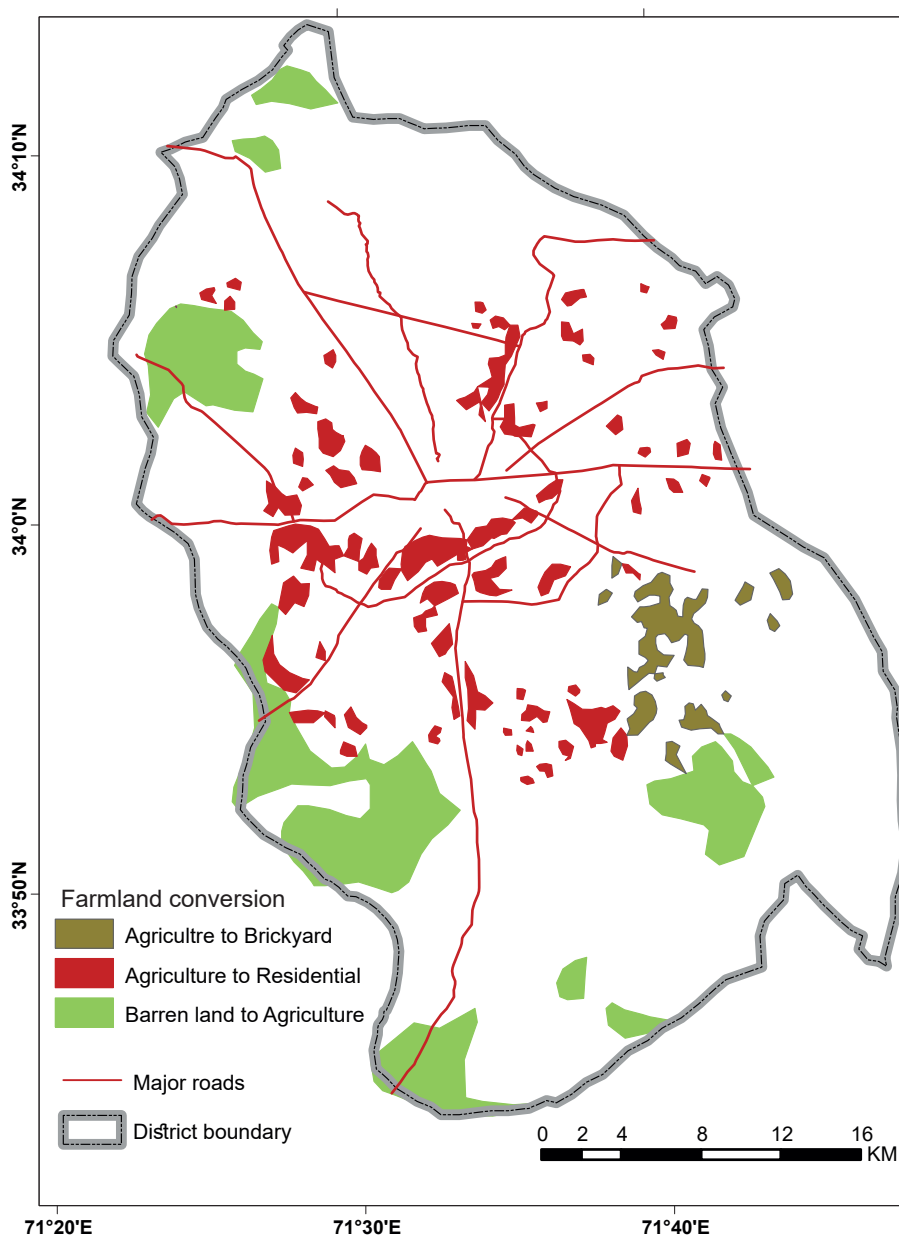


Fig. 5: Pattern of farmland conversion 1991-2012

4 Analysis and discussion

This section is devoted to the evaluation of the causes or forces responsible for the conversion of farmlands to build uses, and farmers' efforts in tackling the pressure and related issue.

4.1 Causes of farmland transformation

In order to understand the problems associated with the urban transformation process and to identify possible solutions, it is essential to first understand the causes of farmland transformation. As could be shown, the growing demand for land for housing construction in the wake of population growth and average income was one of the main reasons for the transformation of arable land. Additionally, the poverty of the farmers resulting from low crop yields and a lack of state support pushes the farmers to sell their land to potential builders and either become a landless farmer or shift to another occupation.

4.1.1 Population and income

Increasing population and income as well as change in social status and attitudes are some factors that impinge upon the demand for certain types of land uses (HAQUE 2014). For example, housing needs increased in the city as a result of fast growing population (Tab. 5), income and enhanced social status - particularly in the last few years. Unfortunately, data on rising income in Peshawar City are not available, but the surrogate figures for rising per capita GDP for the province of Khyber Pakhtunkhwa (of which Peshawar is capital) are given in Fig. 6.

Initially people did not like to move away from the main city and if at all needed, preferred to occupy areas contiguous to main city. Hence initially areas like Nishtar Abad adjacent to old city or Gulberg and Defense in the neighborhood of Cantonment developed. However, with the growth in mobility due to increased car ownership and breaking of social and family ties changed the attitudes. The increase in automobile ownership after the opening of bank loans for purchasing cars has also eased commuting and encouraged the housing development in the periphery of the city on agricultural land. (SAMIULLAH 2012)

4.1.2 Low farm output and yield

Farming has never been an organized activity in the city district and therefore it is also carried out primarily at subsistence level. The current low productivity and yield compared to progressive farms in Pakistan (Tab. 6) is a major hindrance to commercial viability of agriculture.

The low yields of crops, increasing farm fragmentation due to hereditary laws and rising cost of agricultural inputs are some of the factors, which are making farmers poorer and poorer and hence readily willing to sell their land to potential buyers. This is particularly true in the case of small farmers owning land up to 2 ha, who dominate the farming community and constitute 69 percent of all farmers (SAMIULLAH et al. 2018). A group discussion with farmers showed that major constraints faced include the lack of access to inputs (due to high costs) as well as credit and capital; small size of farms and low yields (cf. section 4.2.1).

Tab. 5: Peshawar City District: population growth 1951-2012

Years	Population size	Intercensal increase [%]	Cumulative increase [%]	Annual growth rate [%]
1951	391,000	-	-	-
1961	529,000	35.29	35.29	3.08
1972	807,000	52.55	106.39	3.70
1981	1,113,000	37.92	184.65	3.89
1998	2,019,000	81.40	416.37	3.56
2017	4,269,000	111.4	991.8	5.80

Note: After 1998, the census was conducted only in 2017. Source: PBS.

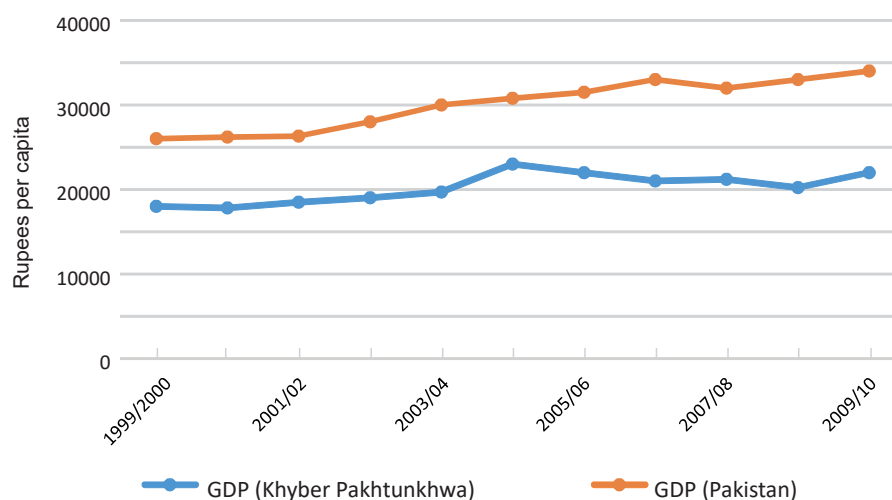


Fig. 6: Khyber Pakhtunkhwa Province: trends in GDP Rupees per capita 1999-2010. Source: IGC (2015).

Tab. 6: Peshawar City District: yield gaps of major crops

Crop	Peshawar City District [Tones/ha]	Progressive farmers Pakistan [Tones/ha]	National average [Tones/ha]	Yield gap Peshawar w.r.t* Progressive farmers yield [%]
Wheat	2.3	4.6	2.6	50
Maize	2.8	7.4	1.8	62
Rice	2.1	4.6	2.8	54
Sugarcane	51.4	106	48.6	52

Source: GoKP (2012b); GoP (2012b); field survey (2012) * w.r.t = With respect to

4.1.3 Development of land and property prices

Land values as indicated by revenue records and field survey have seen steep climb in the last decade in Peshawar City District. Tabel 7 below gives some idea on the steep rise in land values in about two decades between 1991 and 2012 in three urban districts (locally called *mauzas*) of Peshawar City.

The market forces that have impacted on land value and real estate dynamics are demand and supply, availability of infrastructure, size of plot, and within built up area age and condition of buildings. The inflating prices leading to quick money-making trends in real estate is encouraging individuals and companies to increasingly purchase land for housing across Peshawar. The consequence is sprawling built environment in all directions. The land that once provided residents with fresh supplies of vegetables, milk and poultry products are vanishing and fields that produced wheat, sugar cane and maize are also shrinking.

In some cases, lands, even with crops still standing on them have been purchased at low rates by speculators. A few amongst them spotted the potential of the trade some time back and, possessing resources to spare, purchased agriculture fields from small and poor farmers who could not make ends meet because of low crop yield and meager financial returns (KHAN et al 2012). The small and poor farmers are particularly vulnerable to fall in the trap of land speculators. Facing financial hardship, they feel that they have a bargain at hand that can help generate funds to pay their debts and allow them to start life anew in some other job. In the absence of research, one does not know if the hopes of these small farmers materialized or not? The outcome, nevertheless, has been net loss of cultivable land. Having said that, it is appreciable that still many farmers are resisting the commercial pressure on farmland and trying to explore means to increase their income from farmland by exploiting commercial opportunities offered in the urban market.

Tab. 7: Land values (in Rupees) per *marla* in three urban districts 1991-2012

Urban district	1991	2000	2009	2012
Hargoni	20,000	55,000	300,000	650,000
Pakha Ghulam	25,000	60,000	350,000	550,000
Kochian	4,000	8,000	35,000	55,000

Source: GoKP (2012); (1 *marla* = 25.2929 sq. meter)

4.1.4 Farmers' efforts at tackling commercial pressure on farmland

Commercial markets particularly those generated by urbanization present important opportunities to farmers for commercialization. They provide avenues to them for selling higher value crops like flowers, vegetables and fruits from vegetable farms, orchards and vineyards, animal products from poultry and dairy farms, fish from aquaculture, forest products from agroforestry etc. (YEUNG 1987; BIRTHAL et al 2007; WORLD BANK 2008; DEELSTRA and GIRARDET 2019). The work of YEUNG (1987) highlights successes achieved in these endeavors through a literature survey as well as case studies of Shanghai, Singapore, Metro Manila, Lae (Papua New Guinea), and Georgetown (Malaysia). According to him, there has been a noticeable trend "... to divert from traditional food-grain production to cash crops and livestock products" (YEUNG (1987, 2). This trend is especially apparent in countries that have experienced rapid economic growth, such as South Korea, Japan, Hong Kong, and Taiwan (ibid.).

In Peshawar City District, this potential is still far from being utilized. Although, some farmers in the vicinity of built up areas have switched to growing of vegetables and fruits (truck farming). Dairy and poultry farming is also increasing to cater for city market in their products (Fig. 7). These endeavors, however, would need strong government support particularly through the creation of a favorable environment, as indicated by farmers in a group discussion (Tab. 8) including training farmers on efficient production methods (linked R&D, extension and marketing; improved soil and water management, use of quality certified seeds, balanced use of fertilizers and proper plant protection measures, developmental of experimental farms), provision of institutional credits, and assistance in the development of farmers organization for product marketing; particularly cooperatives for small farmers.

4.2 Failures and challenges of urban planning

A key factor responsible for the continuous transformation of farmland to build environment in Peshawar and Pakistan is the lack of political will and planning coupled with institutional and political failure (GoP and UP 2014). Despite presence of planning institutions, planning in Peshawar City District has only been carried out on ad hoc basis (AHMAD and ANJUM 2012). Whatever was planned, it always followed a short-term perspective to solve only the most pressing problems. Projects such as the Hayatabad and Regi Lalma development areas, but also the ring road, are examples of planning in the short term (ibid.). Poor institutional set up, lack of coordination among government agencies, inadequate funds and legal and regulatory shortcomings were other constraints (KHAN et al. 2012).

Like other urban areas, Peshawar City District needs an effective spatial development plan to help guide its growth and implement appropriate land-use policy. Although the authorities in Peshawar have developed two spatial development plans over the past decades - a master plan (GoNWFP 1965) and a structural plan (GoNWFP 1986) for the city - these could not be effective as none of these plans were finally approved. Apart from that, the first plan did not address the problems of uncontrolled urban growth and urban sprawl, but focused on the rapid provision of infrastructure and services (GoNWFP 1965; KHAN et al. 2012). Unauthorized urban sprawl was not even recognized as a problem and continued to encroach upon farmland throughout the 1965-85 period. In 1986, the Structure Plan for Peshawar was prepared (GoNWFP 1986). The new plan tried to correct many shortcomings of the previous Master Plan. It noted, "... there is no significant program of development at any scale, which could provide housing for lower income families." (GoNWFP 1986, 13). As a consequence, it pointed out, that much of the urban growth in Peshawar had not only been piecemeal and of poor construction but had also taken place in a haphazard and uncontrolled manner making development of necessary infrastructure in these areas difficult and too expensive (GoNWFP 1986, 12). While identifying growth zones and local planning units, the plan suggested urgent development of local plans for critical units, where growth was too fast. The plan also recognized the necessity to exercise control on private developments particularly in terms of layout of the plots and building densities. However, the implementing agency of the plan did not succeed in getting it approved (KHAN et al. 2012).

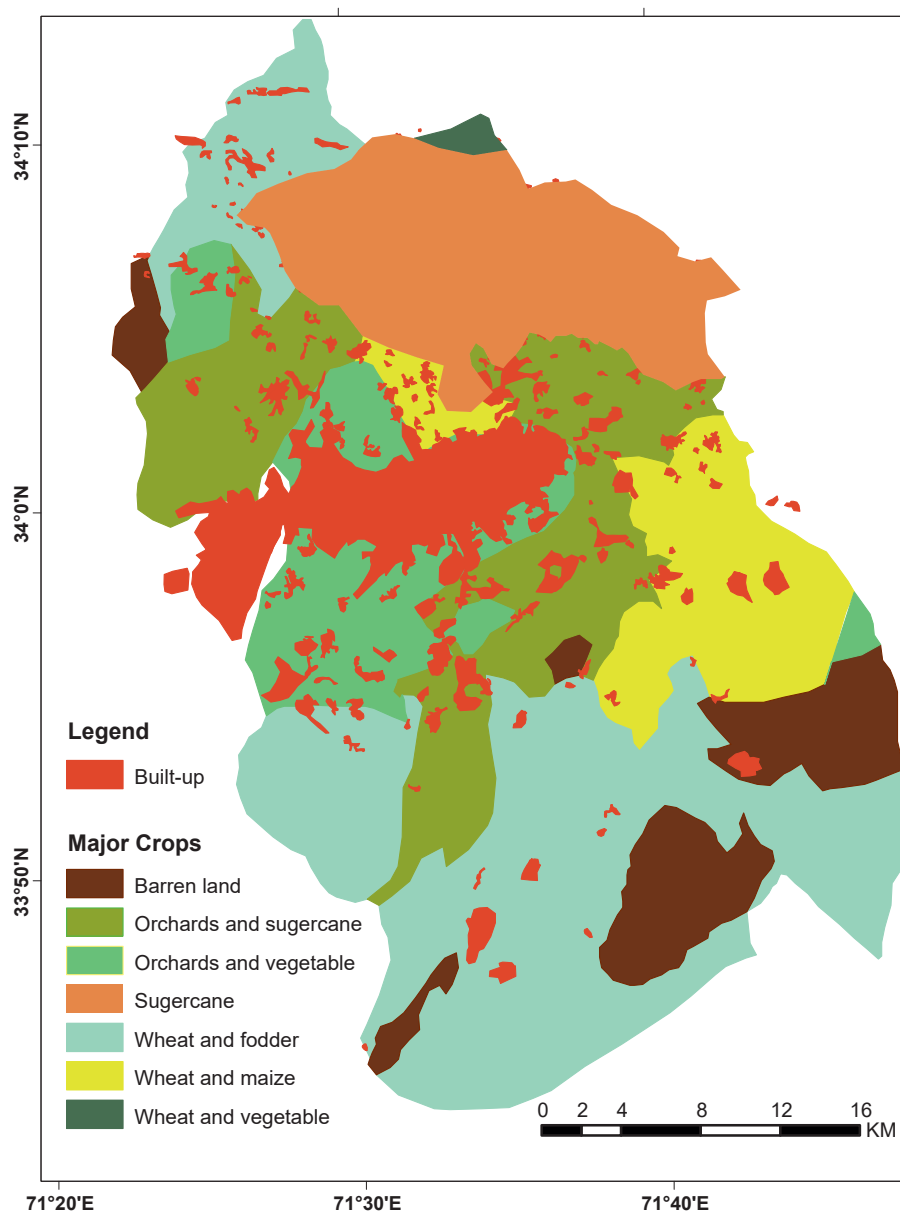


Fig. 7: Spatial distribution of crops in Peshawar. Source: GoKP 2012

Hence the city continued to expand and sprawl in its own fashion towards its peripheries in the absence of planning control.

A major shortcoming of both plans was that their coverage was restricted to a very limited area. In addition, neither of the two plans recognized urban agriculture as an important activity. Paradoxically, most urban planners in developing countries, do not have technical knowledge to handle urban agriculture and therefore they fail to incorporate it in the urban development policies and plans (DE ZEEUW et al. 2011). This is true not only for Peshawar but also for other

cities of Pakistan (AHMAD and ANJUM 2012). Despite its importance, many planners (including those in Pakistan) still consider urban agriculture as a rural activity (QUON 1999). Therefore, DUBBLING (2011) advocates that instead of having separate policy for urban agriculture, it should be included in the existing planning and development policies of the cities.

It is important for policy makers and planners in Peshawar to learn not only from the previous shortcoming in planning but also to derive lessons and learn from good examples in other parts of the world including both developing and devel-

Tab. 8: Summarized aspects emerging from a focus group discussion with farmers

Reason for low farm income	How to make agriculture profitable	Recommendations for government support
Inefficient production methods	Introduction of high value agricultural products with low investments	R&D and agricultural extension
High input costs such as fertilizer and seeds	Reduction in input costs	Subsidy on inputs and provision of high yielding varieties
High water charges	Reduction in irrigation water charges	Reduction in water charges – extension for optimum water use
Lack irrigation facilities in certain areas of the city district	Enhancement of means of irrigation	Government help to develop small storage dams for providing water for irrigation
Lack of credit facilities to the farmers	Credit facilities at low interest rate may help farmers ease debt burden and earn more	Enhancement of institutional credit facilities – long term loans at low rates
Lack of organized and linked R&D, extension and marketing	Development of experimental farms for extension; Assistance in organized marketing	Assistance in revival of farmers organizations and functioning for implementation of R&D efforts & marketing
Small farm size	Extension for making the best from small farms	Assistance in development and functioning of cooperatives of small farmers

oped countries particularly those that have achieved success in developing policies towards promoting urban agriculture like Brazil, Cuba and Argentina (VAN VEENHUIZEN 2006) and city governments that are currently in process of developing policies on urban agriculture (ORSINI et al. 2013; THORNTON 2018). Some other countries like China, Botswana, Benin and Zambia have also strived for policies that help urban agriculture (DE ZEEUW et al. 2011). In addition, several countries have drafted such policies under the umbrella of wide-ranging development programs and strategies like, Poverty alleviation policy, Sustainable urban development strategies and food security schemes (ABU and SOOM 2016).

Lessons are also available from the developed countries, where the city planners have given considerable importance to framing urban agricultural policies. For example, while US cities have zoning regulations, they also have a provision for mixed and integrated land use systems (HASSAN and LEE 2015). The objective is to promote neighborhood-based food and energy production; and encourage nutrient recycling and water conservation (CHATURVEDI and SARKAR 2012). Regarding cooperation and involvement of stakeholders, a very good example has been set by Chicago City Council on how to involve and work with numerous stakeholders in the promotion of urban farming (BLOCK et al. 2012).

5 Conclusion

Urban agriculture is extremely important in Peshawar City District. It covers more than half the area of the district (57%), is very valuable to the economy, employs a large number of people and also contributes to environmental and ecological benefits. The land under farming, however, is shrinking. The land use dynamics depict that the city district is losing nearly 560 ha of farmland each year. A worrisome aspect in this regard is – the loss of most productive and highest quality land. While, some new farmland was added due to extension of irrigation, but the addition was of low quality (land capability class IV category) land. This trend is harmful to future of agriculture in the city district.

The spatial dynamics of farmland transformation indicate that extension of housing or residential use over the farmland is the main factor contributing to this loss. After housing, manufacturing of bricks, an auxiliary industry catering to housing, constitute the next important land use that has encroached upon over a thousand hectares of agricultural land between 1991 and 2012. Marble industry also feeding into construction industry engulfed some 60 hectares of farmland. Commercial use impinged upon some 470 hectares of agricultural land along main roads particularly adjacent to the new Ring Road.

The two main causes for the loss of farmland were lack of commercialization of agriculture despite market demand; and policy and planning failures. If future encroachment over farmland is to be avoided than proper policies need to be put in place based on the rationale of cause-effect relationship. As one of the main causes behind the conversion of farmland is market based a major solution to this has to be market- driven. This means making the farming cost- effective in order to compete in the urban land market. This is the most important way to check transformation of prime agricultural land to other uses - primarily housing. Despite some trend towards commercialization, currently agriculture is an unorganized activity in Peshawar City District practiced primarily for subsistence purpose. This would need to be changed and the commercial pressure on farmlands has to be tackled through exploitation of available commercial opportunities. Urbanization, for example, provides farmers avenues for selling higher value crops and dairy and animal products. The development of nurseries, vegetable farms, orchard, vineyards and dairy and poultry farming could assist in the promotion of high value commercial agriculture.

Urban agricultural has always been part of the city since historic times; however, its integration into the urban planning and policies has been lacking not only in Peshawar but Pakistan as a whole and many other developing countries. Therefore, it is important to include urban agriculture in development plan of Peshawar, but it is also imperative to make it relevant and customized to the objectives and circumstances of the city district. City-level decision-makers can be the primary facilitators for such integration, with appropriate support from the national level, and engagement of the community at local level. This, however, should not preclude learning from good examples in other parts of the world including both developing and developed countries. There is also a need to streamline planning process to guide new housing and urban development through a zoning framework - taking into account provision of housing while simultaneously providing safeguard to prime agricultural land.

Finally, it would also be imperative to create awareness on the issue. It has to be realized by both the government as well as the general public that the encroachment of urban land uses over farmland is cutting into not only local but national food needs and the present policy, or the lack of it, is ultimately bound to cause greater shortages and further dependence on import of foodstuff. Further, in order

to seek stakeholders support, the advantages of urban agriculture in enhancing ecological sustainability particularly tackling climate change issue along with advancing local economic resilience will need to be disseminated widely.

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