URBAN EXTENSION TREND IN SINNURIS DISTRICT, EL-FAYOUM GOVERNORATE, EGYPT.

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ABSTRACT

The fertile soils of Egypt are of a paramount importance in term of strategic economical decision. In the last few decades encroachment on the fertile agriculture soils was tremendously increased by urbanization.

Sinnuris District in El-Fayoum Governorate was selected to follow up the urbanization impact during the period from 1957 to 2010.

The urbanization areas were estimated in years 1957, 1984 and 2010, by using details maps (scale 1: 100,000) published from Egyptian General Survey Authority, (EGSA). Also the increasing of encroachment were estimated 1984 from the Thematic Mapper (TM5), while the urban area in 2010 was estimated by Quick Bird (QB) and the aid of field check. Data showed that, the urban areas were 957.45, 3003.33 and 6128.84 fed. in years 1957, 1984 and 2010, respectively. The annual increasing rate was equivalent to 75.77 fed.yr^{-1} during 1957 up to 1984 and 120.21 fed.yr^{-1} during 1984 to 2010.

The study cleared up that, increasing of population percent from (1984-2010) was 104.07 less than the increasing of urbanization percent (2%). This was attributed to the higher input of real estate investment compared with that of agricultural investment.

The study elucidated that, the loss of the geographical area was 3125.51 fed. and this means 6251.02 fed. of productive area. Estimation of annual agricultural production return of such area ranged from 17'833'022'37 to 44'387'367'53 LE.

To protect the fertile agriculture soils from the encroachment, the authors recommend:
1. Building new cities in the desert.
2. Interesting with family planning programs.
3. Increasing the punishment for encroachment to the agricultural soils or the trickery to be left uncultivated.
4. Increasing the density of population.
5. Applying of urbanization.
Keywords: Encroachment, Urbanization, Desertification, Sinnuris District.

INTRODUCTION

Nowadays Egypt has an over-increasing need for food to satisfy the demands of the over-increasing population. Consequently, a maintain for soil and water resources, which are the main elements for agriculture production is a target.

According to Abdel Hady et al. (1983), reported the slow expansion of cultivated land area compared to the very rapid increase of human population. On other hand; the new expansion in the desert area results in a weak out come, while the old cultivated fertile lands of the delta and valley in Egypt are lost because of urbanization.

Makhanya (1993), on his work on some areas in South Africa focused on the successively loss of the highly productive land, desertification of agricultural lands, due to urbanization process in running very fast with a discernable rate.

Abd El-Halim et al. (1996), in their studies on Kafr El-Sheikh, Dekernis and Minia Cities, found that, the settlement areas, on a good productive soils, generally is increased from 180 fed. to over 2000 fed., during the period from 1947 to 1989.

Khalil et al. (1999) reported that, urbanization growth rate is increasing with the elapse of time and figured out to 10.3 and 32.6% yearly, for both period 1950-1987 and 1987-1995, consecutively with reference to the acreage of urban and agricultural areas.

Salem et al. (2001), reported in their study on Damanhour city, Bahaira Governorate that the urban areas were 127, 630, 711 and 1828 fed. in years 1911, 1959, 1985 and 1998, respectively, with yearly increasing rate 10.3 fed. (1911-1959), 3.1 fed. (1959-1985) and 85.9 fed. (1985-1998) their study clear that, the loss in geographic area was 1117 fed.; this means that 2234 fed. as productive area; and leads to yearly loss from strategic agriculture crops. This mean equal loss about 2'028'192 to 5'103'707 LE.

Nashida (2002), reported that in her study on Kafr El-Zaiat city, Gharbia Governorate, the urban areas were 364.71, 619.05 and 968.47 fed. in years 1935, 1985 and 2001 in respectively, with yearly increasing rate 5.09 fed. (1935-1985), 21.8 fed. (1985-2001). Her study cleared that, the loss in geographic area was 349.42 fed., this mean 698.84 fed. as productive area; and leads to yearly loss from strategic agriculture crops. This mean equal to loss about 1'520'975 to 4'330'969 LE.

Abd El-Nabi, et al. (2014), reported in their study on El-Bradaa, El-Kanater Al-Khairia Center, Kalioubia Governorate, that the urban areas were 37.4, 83.7 and 271.6 fed. In years 1965, 1985 and 2013 in respectively, with yearly increasing rate 2.31 fed. (1965-1985) and 6.71 fed. (1985-2013). Their study clear that, the loss in geographic area was 187.9 fed.; this mean 375.8 fed. as productive area; and leads to yearly loss from strategic agriculture crops. This mean equal to loss about 1'781336 to 2'666491 LE.

The first aim of this study is to follow up an urbanization extension of Sinnuris District and estimate the urban growth trend. In addition to its impact on the progressively decrease of the highly productive cultivated land of Sinnuris area using base maps, Landsat 5 and Quick Bird (QB) data. The second aim is to calculate the loss in National Productive from the strategic crops as result of waste the fertile agricultural soils.

MATERIALS AND METHODS

An urban area is usually covered by urban activities. It is easy possible with the aid of Landsat 5 perspective to delineate the boundary of an urban by simply looking at an image of the city and deciding where a continues urban growth stops and rural activities begin.
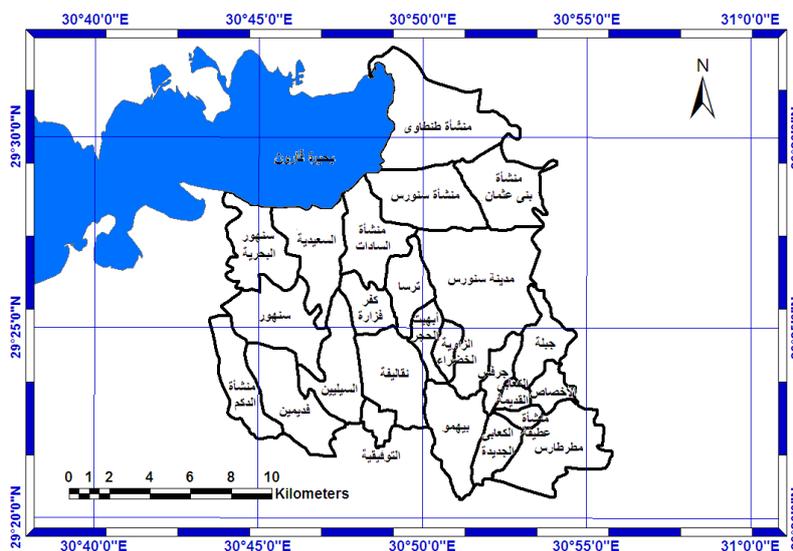
The investigated area is located at the border line of the Sinnuris District 57929.2 fed. including the cultivated land and settlements.

Sinnuris District is located north of lake Karoun, South Fayoum Center, east Tamia Center and West Ebshaway Center. It lies essentially on crossing of longitude and latitude 30° 55' east, 30° 45' west, and 29° 30' north, 29° 20' south in respectively, (map 1).

The following outlines highlight the key element of the different steps applied of the current study: Topographic map and satellite imagery are corrected by Egyptian Transverse Mercator (ETM): 1-Toporgaphci map 1: 100,000 of the studied area published in 1957 by Egyptian General Survey Authority (EGSA, 1957). 2-Landsat satellite imagery TM5 or Thematic Mapper of the studied area for 1984. 3-Quick Bird (QB) satellite imagery of the studied area for 2010. 4-Delineate and the boundary of urban area and the cultivated land on the corrected map 1957, Thematic Mapper 1984 and Quick Bird 2010 which illustrated on maps 2, 3 and 4.

5) Field checks have been carried out for the studied areas aiming at limit and delineate the urban growth until 2010 and performing the ground truth. This work was carried out by the General Organization for Physical and Planning (GOPP, 2010), Committee No. 36.

The current study is based on the fact that there has been a reduction of the fertile agricultural land as a results of urbanization encroachment.

Map (1): Location of Sinnuris District.

RESULTS AND DISCUSSION

The total studied area was approximately 57929 fed. Data in Table (1), Map (2, 3, 4) and Fig. (1) elucidated that the total settlements were 957.45 fed. in years 1957. The urban area was elevated to 3003.33 and 6128.84 fed. in years 1984 and 2010, respectively.

At the first period from 1957 to 1984 (27 years); the loss of the highly fertile cultivated soils was 2045.88 fed. with an annual decrease 75.77 fed.yr^{-1}, the increasing percentage of the urban area was about 5.18% according to the base area recorded in 1957 (957.45 fed.).

During the following period (26 years); the urban encroachment of Sinnuris District, detected by field truth by using modified (Landsat5 & Quick Bird) maps, the loss was 3125.51fed. of fertile cultivated soil. The rate of decrease of such loss is equivalent to 120.21 fed.yr^{-1}.

The increasing percentage of urbanization amounted to 10.6% with respect to the area recorded (3003.33 fed.), in 1984 (Table 1). Comparing the increasing percent of population 10.6% with the increasing percent of population (213.68%) in the last stage 1984 to 2010 indicated that, the urban encroachment remarkable exceeded the requirements of population increase, this may be interpreted as the return of real estate investment in much more than that of agricultural investment.

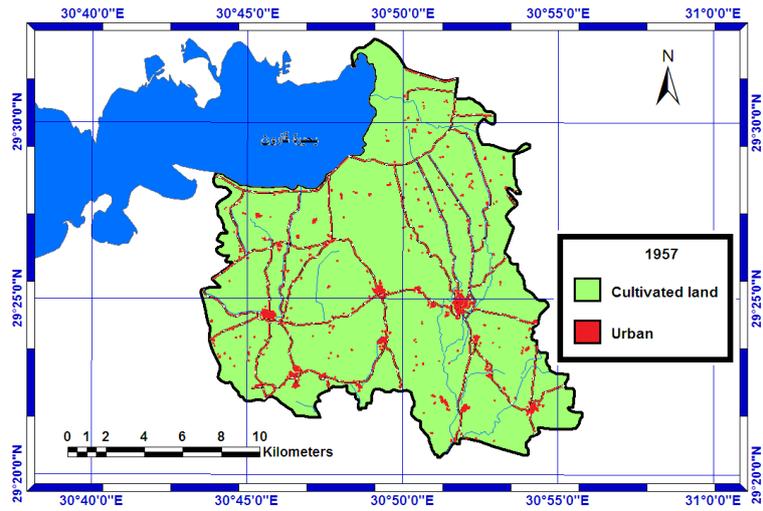**Table (1): Urban encroachment in Sinnuris District from 1957-2010.**

Year	Urban Area (fed.)	Difference (fed.)	Rate fed.yr^{-1}	(a) % Increasing in urban	Population number (person)	(b) Increasing (%)	Density of population (person/fed.)
1957	957.45	-	-	-	180774.10	-	-
1984	3003.33	2045.88	75.77	5.18	308560.87	213.68	102.74
2010	6128.84	3125.51	120.21	10.60	516351.34	104.07	84.24
2050	10937.24	4808.40	120.21	18.90	1140123.49	78.46	104.24

(a): % Increasing in Urban = area of urban (fed.) / studied area x 100
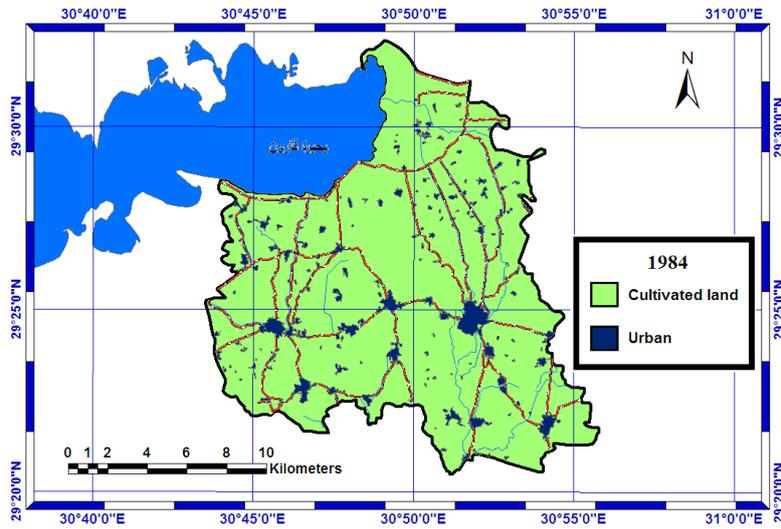**(b): Increasing % = Difference (fed.) in urban / urban area (fed.) x 100**

Fig. 1 elucidate the rate of encroachment is parallel to population growth rate in the period from 1957 to 1984 (A area). However, in the period from 1984 to 2010 the deference between encroachment rate and population growth was increasing with the time (B area). The estimation of the stage from 2010 to 2050 is represented in (C area). The encroachment area estimated was 10937.24 fed. having population of 1140123.488 person. In other wards dense population is 104.24 person.fed^{-1}. This indicates that, the encroachment growth is more than the requirements of population.
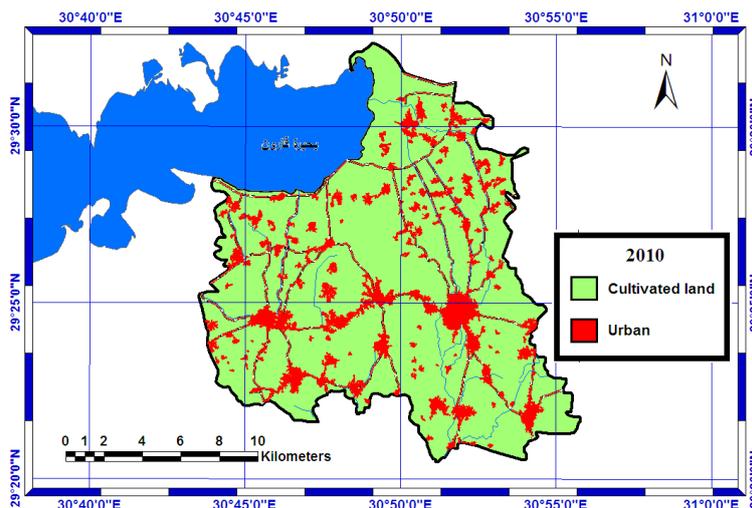
Data in Table (1) show that, the density of population in 1984 was 102.74 person.fed^{-1} but changed to 84.24 person.fed^{-1} at 2010. This figure is considered very low in comparison to the international one (150 person.fed^{-1}).

Map (2): Urban encroachment in Sinnuris District 1957.

Map (3): Urban encroachment in Sinnuris District 1984.

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Map (4): Urban encroachment in Sinnuris District 2010.

The process of increasing the density of population seems to be done by replacement and renewal of the housing having one or two floors to be four or five floors; on the same piece of land. The density of population must be about 250 person.fed^{-1} at least.

Data in Table (2) show that, the fertile agriculture soils area loss between 1984-2010 was about 3125.5 fed., it equal 6251.02 fed. production area; base to the fertile soil cultivated 2 periods (two seasons in year). That means loss in strategic crops as cotton, wheat, rice, maize, onion and clover; amounted to about 40381.59 Quintal cotton, 115893.91 Ardeb wheat, 25566.67 Ton rice, 149649.42 Ardeb maize, 79825.53 Ton onion and 25004.08 per.cutting clover in year. That is mean about 17'833'022'.37 to 44'387'367.53 loss every year, due to the loss of agricultural soils in Sinnuris District; this price value and productive one fed. according to up data productive and price in Central Management for Economic Agricultural (CMEA).

Table (2): Main production of feddans of some crops and their LE prices 2010.

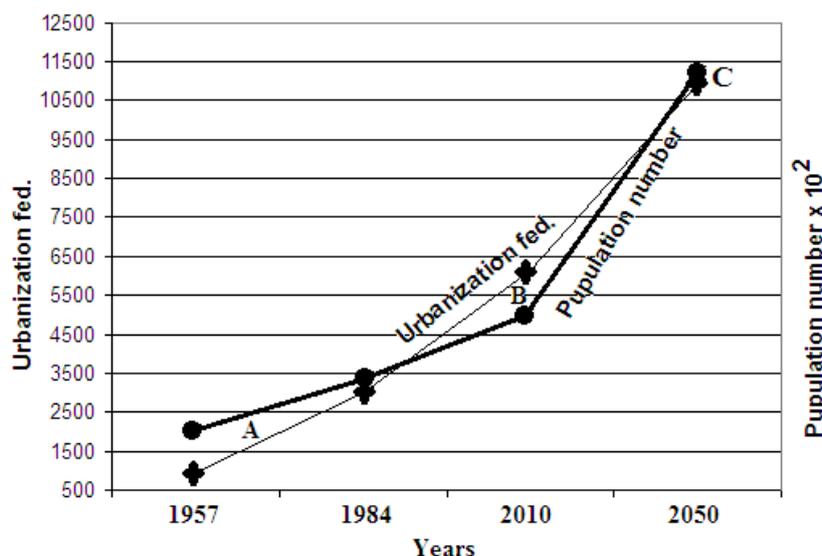| Crops	Mean Production / fed.			Area loss (fed.)	Total loss production (kg/season)	unit kg	Price LE	Total loss LE	Total loss $
	Mean	Unit	Kg						
Cotton	6.46	Quintal	50	3125.51	40381.59	50	812.0	32789851.08	4684264.44
Wheat	18.54	Ardeb	150	3125.51	115893.91	150	383.0	44387367.53	6341052.50
Rice	4.09	Ton	945	3125.51	25566.67	1000	1466.0	37480738.22	5354391.17
Maize	23.94	Ardeb	140	3125.51	149649.42	Ardeb	198.0	29630584.92	4232940.70
Onion	12.77	Ton	1000	3125.51	79825.53	Ton	223.4	17833022.37	2547574.63
Clover	4.00	Per-cutting	868	3125.51	25004.08	Per-cutting	868.0	21703541.44	3100505.92

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Fig (1): Relationship between urbanization, population and time.

In order to protect the fertile agriculture soils against encroachment, recommended to:
1) Construct the new cities on desert lands.
2) Execute of family planning programs.
3) Aggravate of punishment encroachment and/or the trickery of leaving soils uncultivated.
4) Increase the density of population on one led to be 250-300 person/fed. by increasing the floors of existed houses by one or two floors.

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الزحف العمرانى على الأراضى الزراعية فى مركز سنورس – محافظة الفيوم – مصر

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– تعتبر الأراضى الزراعية الخصبة أهم رصيد إستراتيجى فى مصر وفى الوقت الحالى زادت الهجمة الشرسة على الأراضى الزراعية بواسطة الزحف العمرانى. وقد اختير مركز سنورس بمحافظة الفيوم، لدراسة إتجاه ومقدار الزحف العمرانى خلال الفترة من ١٩٥٧ حتى ٢٠١٠.

– وقد قدرت مساحة العمران فى مركز سنورس فى السنوات ١٩٥٧، ١٩٨٤، ٢٠١٠ وذلك باستخدام خرائط الهيئة العامة للمساحة المصرية ١ : ١٠٠٠٠٠ وكذلك تفسير صور الأقمار الصناعية لسنة ١٩٨٤، كما تم حساب مساحة العمران سنة ٢٠١٠ بواسطة الفحص الحقلى وذلك بتوقيع الزيادات على خرائط التصوير الفضائى على الواقع فى الحقل. وأوضحت النتائج أن المساحة كانت ٩٥٧.٤٥، ٣٠٠٣.٣٣، ٦١٢٨.٨٤ فدان فى السنوات ١٩٥٧، ١٩٨٤، ٢٠١٠ على الترتيب بمعدل ٧٥.٧٧ فدان سنوياً (١٩٥٧-١٩٨٤)، ١٢٠.٢١ فدان سنوياً فى الفترة (١٩٨٤-٢٠١٠).

– كما أوضحت الدراسة أن الزيادة فى النسبة المئوية للسكان كانت ١٠٤.٠٧% تقل عن الزيادة فى النسبة المئوية للزحف العمرانى (٢%). وهذا يعزى إلى زيادة العائد من الاستثمار العقارى بالمقارنة بالعائد من الاستثمار الزراعى.

– كما أوضحت الدراسة أن الفقد فى المساحة الجغرافية كان ٣١٢٥.٥١ فدان أى ٦٢٥١.٠٢ فدان مساحة إنتاجية، وهذا يسبب خسارة سنوية فى الإنتاج يتراوح بين ١٧٨٣٣٠٢٢.٣٧ إلى ٤٤٣٨٧٣٦٧.٥٣ جنيه مصرى.

– لذا يوصى بالحفاظ على الأراضى الزراعية الخصبة من الزحف العمرانى بالاهتمام ببناء المدن الجديدة فى الصحراء وتنظيم الأسرة لوقف الزيادة السكانية وتغليظ عقوبة التعدى على الأراضى الزراعية وتبنى سياسة زيادة الكثافة السكانية فى المدن والتكثيف العمرانى.