RETREATING RATE ESTIMATION OF THE FERTILE ALLUVIAL SOILS IN THE NILE DELTA UNDER THE URBAN ENCROACHMENT BY USING REMOTE SENSING DATA AND GIS TECHNIQUE

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ABSTRACT:

The area under study is situated in the Nile Delta as represented by Toukh district (Markaz), Qalubiyah province. The urban change detection was based on the spectral signatures of satellite SPOT-4 data that were acquired in each year of 1995 and 2007. The satellite data were visually interpreted to specify the physiographic units for evaluating their denatured land. The associated soils were classified and evaluated according to the systems of Soil Taxonomy and Land Evaluation respectively. The change detection cleared that the urban encroachment denatured fertile alluvial soils, which can not be easily developed in the newly reclaimed areas even with a high capital intensity and daily expensive energy.

These valued retreated fertile Nile alluvial soils represent unique physiographic-soil characteristics of highly suitable soils (S1) for the irrigated agriculture. These soils could be classified as *Typic Haplotorrerts, clayey*, locally *Leptic Haplotorrerts, clayey over fine loamy* in the deltaic alluvial plain; *Typic Torriorthents, fine loamy, locally fine loamy over coarse loamy* in the levees; *Typic Torriorthents, coarse loamy over sandy* in the point bars and reworked parts of sub-deltaic outcrops; *Typic Torriorthents sandy* in the sub-deltaic outcrops. The soils developed in the alluvial deltaic plain (dominant unit) were evaluated for specific crops of the common cultivated ones as herbaceous crops (mainly cotton) and trees (mainly citrus). These soils are categorized as highly suitable class (S1).

The value of these Nile alluvial soils also based on the profitable specific quality of cotton "extra long staple" that was highly adapted with their soil characteristics. This value is negatively affected, being the urbanization is mainly acting on the annually cultivated area, which loosed 3304.9 feddans from the year 1995 to 2007. This annual cultivation is dominated by cotton crop of specific quality that can not be shifted to the newly reclaimed lands, otherwise it will be collapse. The cotton quantitative quality for exports, ginning, and spinning and textile industries will be badly affected under this urban encroachment. Rather high unique value is the sit and situation of the studied area as the local skilled agriculture labor and being centrally situated in Egypt with intensive spidery infra-structure network, extending to the other regions.

Monitoring the retreated fertile land in the studied area indicated that, in the year of 1995, about 3681.2 feddans or 1546.1 hectares of the total area (55127.5 feddans or 23153.0 hectares) were urbanized, and then the urban area increase to about 6350.1 feddans or 2666.9 hectares in the year 2007, denaturing about 2668.9 feddans or 1120.9 hectares were loosed through 12 years from the residual cropped lands in 1995. Thus, the rate of the urban encroachment was assessed as 222.4 feddans or 93.4 hectares per year. If this flurried urban encroachment trend is ceaselessly continues, the duration of entire loss of this fertile cultivated land can be estimated as 197

years. This situation may be more serious in another scanned area under more flurried attack. Hence the cultivated lands in the Nile Delta will be most probably entirely denatured as the integration of time-urbanization encroachment and their demographic attributes will be in turn deformed. Accordingly, it is a call for keeping the lands of the Nile alluvium as a protectorate.

Key words: Urban encroachment, The Nile Delta lands, remote sensing data and GIS technique.

INTRODUCTION

The highly productive land of River Nile alluvium is denaturing by flurried urbanization encroachment, reflecting a serious human mode, acting on a unique valued land. This incredible mode must create a deep dramatic impression to the pedologists, economists and the decision makers. Such problem has been clearly dawned and an urgent solution has become inevitable. It is a downcast feeling, being the demographic features and economical feasibility have been determined on these Nile alluvial lands by uncontrolled supply and demand of individuals, rather than to be under firm strategic economical concept. This disastrous effect is leading to the entire loss of these valued lands within the near coming decades, meanwhile the bare areas in Egypt are very vast for creating a new formal demographic features. The resultant of this loss is closing down many canals of water flow network that integrated to be dumped.

According to **Afify *et al.* (2007)**, Ancient Egyptians named the cultivated lands in the Nile Wadi and Delta of Egypt as "Ta Kemit" [etymology: Hieroglyphic: Ta = Land, Kemit = black; in Hebrew Kemit = Kam = heat or warm]. Accordingly, Ta Kemit means the powerful black soils, which later called "*Aigyptos*" to be Egypt. Wherever these lands are denatured, it means that Egypt loses a profound part of its inheritance concerning the formal demographic-land association. The same authors concluded that, the view of cropped-land pattern in the year 1947 was viewed in the year 2001 as cropped-urbanized land pattern, which loosed annually 1453 feddans from 1990 to 2001 in Menufeyah province. The clue indicated that Delta Nile may be entirely urbanized within 119 years under this catastrophic urbanization encroachment

Salem and Azam (2006) concluded that, the rate of the urbanized cultivated lands in Biba area, Beni-Suef Governorate was 1.22 feddans per year (from 1985 to 2004), however; the loss of cultivated land was 23.15 feddans. Taken into consideration the area is cultivated twice yearly, the loss land equals 46.30 feddans. They added also that the average of annual agricultural output for the urbanized area from 1985 to 2004 ranged between 3247.82 and 150362 L.E. yearly.

Egyptian National Specialized Committee (ENSC, 2003) expected that Egypt will loss all its old land by the year 2080 and will be mainly depend on the total new reclaimed lands. The loss in the cultivated area was estimated from the year 1952 to 2002 as more than 1.6 million feddans. This agricultural land loss means that the loss of 100,000 jobs opportunity yearly versus loss of 60,000 feddans yearly Such problem also caused an environmental degradation, human health hazards and negative impact on the surrounding agricultural areas. **Harrison (1992)** estimated the loss in cultivated land between 1973 and 1985 by 13 % of farmland in Egypt that alternated to urban.

Aboel Ghar *et al.* (2004) monitored the agricultural land changes in the Eastern Nile Delta, concluding that, however the urban area increased by 34%, which was considered to be the greatest loss in the studied area. Such increase in urban areas for the highly productive agriculture land in the Nile Delta was mainly attributed to overpopulation and economic growth. In spite of the continuous efforts to reclaim the desert areas and increasing the cultivated land, agricultural land has been decreased by about 2 % yearly. At the same time, more concern is required to prevent the urban encroachment at the expense of productive agricultural land.

Therefore, the objectives of this study are to update a call for protecting the fertile cultivated Nile alluvial soils, conveying a precaution concerning the negative effect of the urban encroachment over valued fertile ones. Also, to produce timely database using the applied methods and approach that serve the purpose of monitoring this problem.

MATERIALS AND METHODS:

The used data that cover the studied area (Figure, 1) are geometrically corrected raster layers of Landsat SPOT4 data acquired in 1995 and 2007. These layers were manipulated in cartographic software for delineating the physiographic and urban polygons by the visual interpretation resulting in a GIS (Geographic information system) composite for the selected terrain as digital maps. The used GIS displays are attributed as Universal Transverse Mercator (UTM) projection, zone 36 Spheroid and Datum is WGS 84. The main roads, railways and water flowing canals were buffered as areas, while the sub roads and un-wheeled tracks were estimated as percentages within selected sample areas, using the supervised classification.

Field truth was performed for review the urban mapping units and to identify the soil characteristics at representative sites using the **Soil Survey Manual of USDA (2003)**. Laboratory analyses for particle size distribution and exchangeable sodium percentage (ESP) were carried out by using the Pipette and Hissink's methods, respectively. **(Piper, 1950)**. Calcium carbonate and total salinity, which is expressed as electrical conductivity (EC), were determined using Calcimeter and soil paste extract, respectively, **(Black *et al.*, 1965)**. Soil pH in the soil paste and gypsum content were determined using methods outlined by **USDA (1954)**. Soil Taxa were classified according to **USDA (2006)**. By using some soil physical and chemical characteristics, the studied lands were evaluated for irrigated agriculture according to the parametric system undertaken by **Sys and Verheye (1978)** as well as for specific crops according to **Sys *et al.* (2003)**. The spatial distribution of cultivated crops were defined according to the Land Cover Classification System (LCCS), which is outlined by **Di-Gregorio and Jansen (2004)** with the aid of supervised classification.

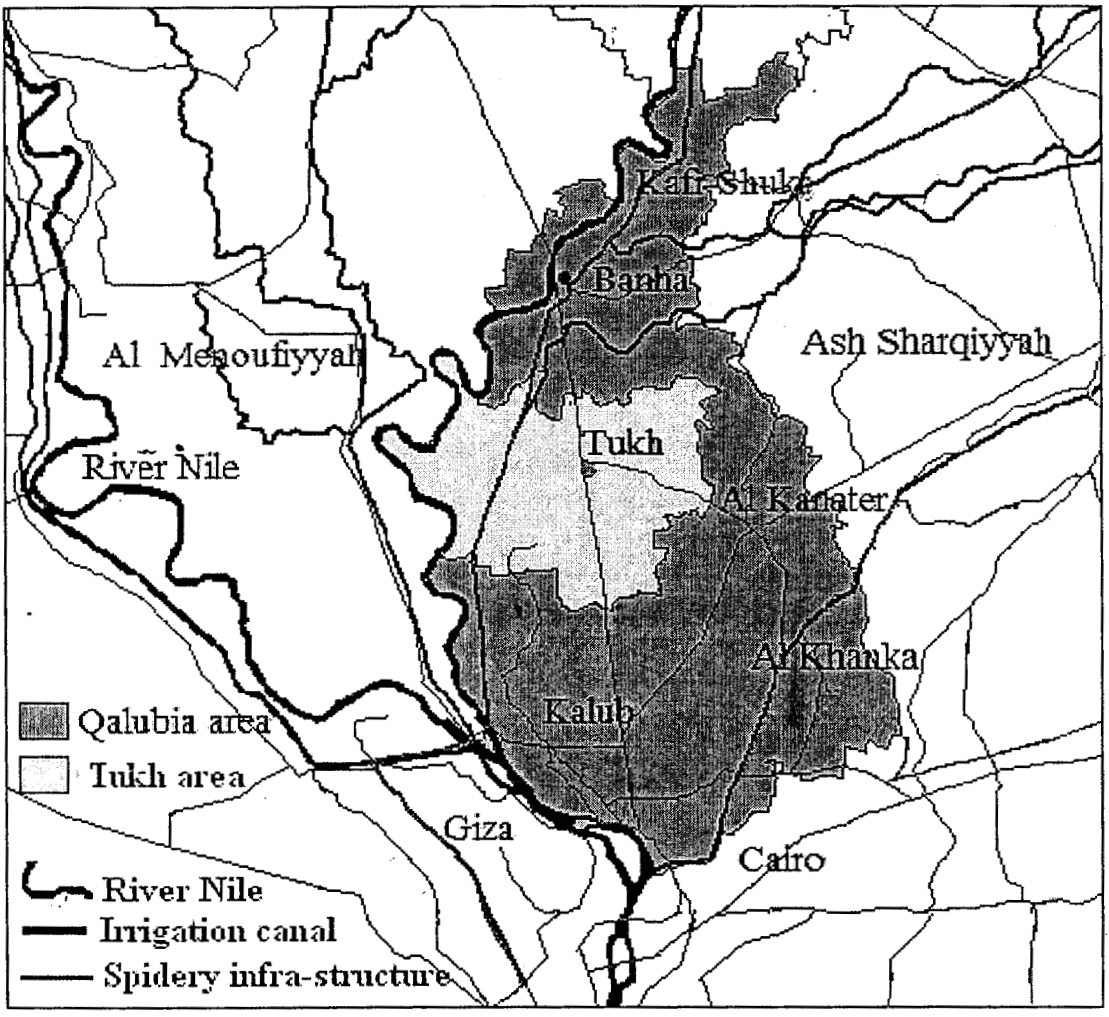


Figure 1. Sit and situation of Toukh district (area under study), Qalubia province, Egypt.

RESULTS AND DISCUSSION:

The results and discussion of the retreated cultivated Nile alluvium value are achieved through the following items.

I. The value of the retreated cultivated Nile alluvium:

a. Unique physiographic-soil characteristics:

The River Nile alluvium was deposited as the action of water flows that deposited the soil solum along a general south-north descending slopes and radial flows of north-east and north-west descending slope under a potential power of natural water flow. Naturally and perpetually, the water flow with the same direction without engine, giving the renaissance to the lands of the same origin as a unique natural twine that was globally recognized. This harmony of "Land-River Nile Mode" is considered a very high economical value that can not be designed by man-mad action even with a very expensive technology, daily loss of energy and irrigation water resourceful (**Afify *et al.*, 2007**).

The Nile alluvial soils have flat surfaces, well structured that improves aeration in the Vertisols, very deep well drained with sufficient moisture regime as improved by a good water holding capacity, being in clayey soils. Being these soil sediments are alluvial they can be detected as rich nutrient soils. The studied area could be categorized into five physiographic-soil units, as shown in Figure 2 and Table 1. Their features are described as follows:

1. Deltaic alluvial plain:

This unit is the major physiographic unit in the studied area. It is characterized by flat surface, which was paved under periodically inundated with water during high flow periods. The soils of this unit could be classified as "*Typic Haplotorrerts, clayey*" locally "*Leptic Haplotorrerts, clayey over fine loamy*"

2. Levee:

This physiographic unit is a narrow flatten relatively higher surfaces of alluvium that was deposited at the side of the channel during high discharge periods when the area was previously inundated. The relatively coarser sediment settled out near the stream channel forming these levees and finer material moved away to the alluvial plain. The soil taxonomic units of these levees are "*Typic Torriorthents, fine loamy, locally fine loamy over coarse loamy*"

3. Point bar:

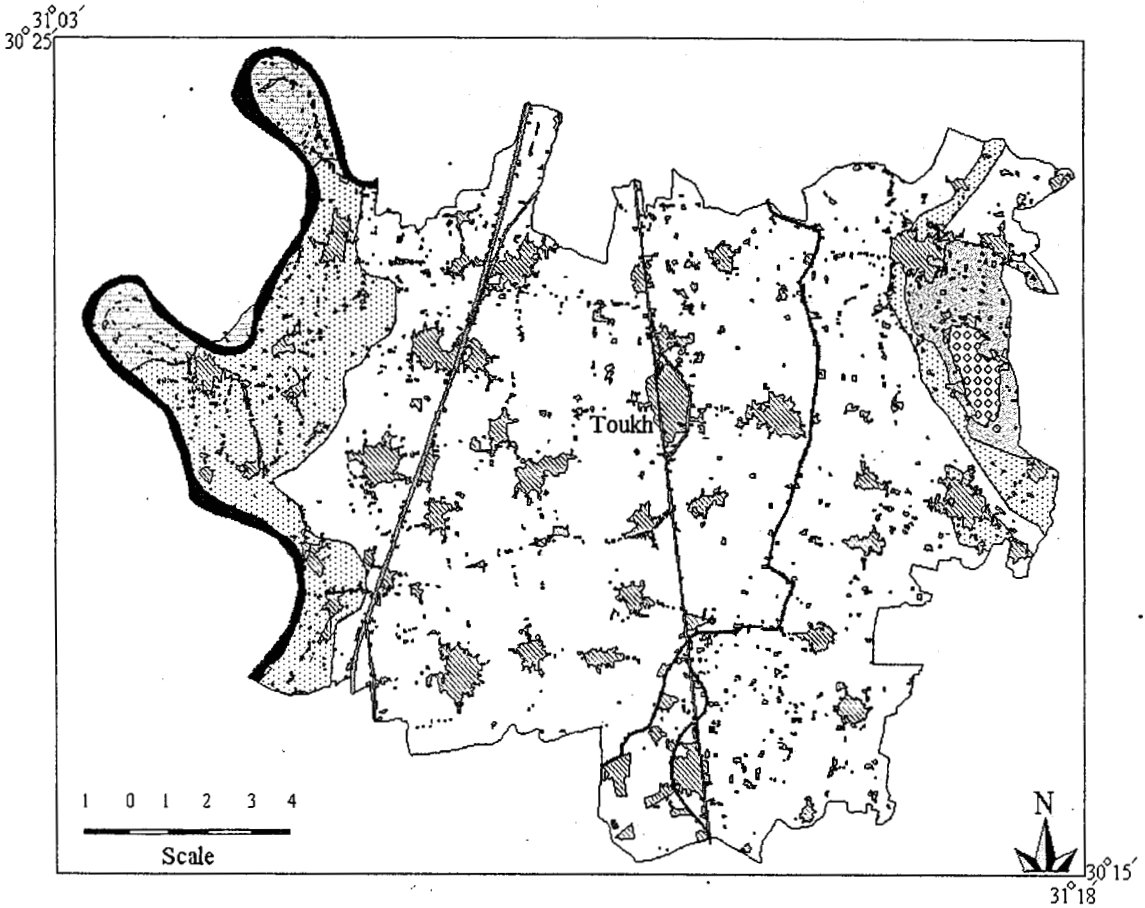
Point bars developed on the side bank of the meander bend, while the outside bank is eroded. They are delineated inside the accurate bends of the River Nile Demietta branch in the western side of the studied area. Their location is clearly influenced by the meandering path, including the soil taxonomic units of "*Typic Torriorthents,, coarse loamy over sandy*".

4. Sub deltaic outcrop:

This physiographic unit is an outcropping of the relatively older sediments of the River Nile alluvium, which still bare area, including the soils of "*Typic Torriorthents, sandy*".

5. Reworked sub deltaic outcrop:

This physiographic unit has the same origin as the abovementioned one, but was utilized for the agriculture land use. The soils of this unit were classified as "*Typic Torriorthents, course loamy over sandy*"



Physiographic unit	Taxonomic unit	Suitability class
Alluvial deltaic plain	* *Typic Haplotorrerts, clayey*	S1
	* *Leptic Haplotorrerts, clayey over fine loamy*	S1
Levee	* *Typic Torriorthents, fine loamy*	S1
	Typic Torriorthents, fine loamy over coarse loamy	S1
Point bar	*Typic Torriorthents, coarse loamy over sandy*	S1
Sub deltaic outcrop	*Typic Torriorthents, coarse loamy over* sandy	S2
Reworked sub deltaic outcrop	*Typic Torriorthents,* sandy	S2

* The dominent soils

Uraban area
River Nile
Main irrigation canal
Main asphalted road

Figure 2. The physiographic-soil, taxonomic units and suitability classes.

Table 1. Suitability classes of the identified physiographic-soil attributes in the studied area.

Physiographic -soil unit	Profile No.	Depth (cm)	Particle size distribution %			Texture class	$CaCO_3$ %	Soil pH	ECe (dS/m)	ESP	Land suitability	
			Clay	Silt	Sand						Rating index	Class
Deltaic alluvial plain	1	0-25	42.1	26.7	31.2	C	1.8	7.9	1.1	6.5	80.7	S1
		25-65	47.4	25.1	27.5	C	2.2	7.8	2.6	4.5		
		65-110	48.5	27.3	24.2	C	1.5	7.5	3.4	4.9		
		110-50	50.8	28.2	21	C	1.1	7.6	3.7	7.9		
	2	0-30	43.9	25.1	31	C	1.3	7.5	2.2	6.3	80.7	S1
		30-75	47.5	25.2	27.3	C	1.2	7.7	2.1	4.9		
		75-150	44.5	34.8	20.7	C	1.4	7.7	1.3	4.4		
	3	0-25	45.5	29.1	25.4	C	1.5	7.8	0.9	2.4	83.4	S1
		25-70	46.6	28.9	24.5	C	1.6	7.8	0.8	2.4		
		70-150	36.5	28.2	35.3	CL	0.6	7.7	0.6	2.7		
Levee	4	0-30	28.5	24.6	46.9	SCL	1.9	7.6	4.5	2.8	90.2	S1
		30-65	28	24.5	47.5	SCL	1.8	7.5	4.9	7.9		
		65-150	31.2	19	49.8	SCL	1.4	7.4	4.7	7.2		
	5	0-30	29.1	24.5	46.4	SCL	2.2	7.5	1.1	3.1	86.8	S1
		30-60	37	27.2	35.8	CL	1.6	7.6	0.9	4.4		
		60-150	12.7	10.8	76.5	SL	1.8	7.7	1.0	2.3		
Point bar	6	0-30	21.2	11.4	67.4	SCL	2.2	7.6	1.2	3.3	75.2	S1
		30-60	12.7	10.8	76.5	SL	1.3	7.7	1.3	5.0		
		60-95	9.1	7.5	83.4	LS	1.1	7.8	1.1	5.9		
		95-150	8.9	6.8	84.3	LS	0.8	7.7	1.4	6.6		
Reworked sub-deltaic outcrop	7	0-25	11.2	11.7	77.1	SL	1.9	7.7	1.6	5.4	67.1	S2
		25-65	11.8	9.7	78.5	SL	2.0	7.9	2.5	7.5		
		65-150	9.9	6.8	83.3	LS	1.1	7.5	3.9	7.2		
Sub-deltaic outcrop	8	0-35	12.4	11.5	76.1	SL	3.2	7.8	2.9	5.4	62.9	S2
		35-75	9.9	9.8	80.3	LS	3.3	7.7	3.9	4.6		
		75-150	7.9	6.8	85.3	LS	3.7	7.6	3.8	3.7		

S=sands, LS=loamy sands, SL=sandy loams, SCL=sandy clay loams, Cl=clay loams, C= clays
S1=highly suitable

b. Land suitability for irrigated agriculture:

According to the parametric system of **Sys and Vrheye (1978)**, the land characteristics were evaluated for the irrigated cultivation to asses their limitation intensity for soil productivity, as follows:

- Topography is flat to almost flat.
- Drainage condition is well to moderate.
- Soil texture as sliced and averaged for each soil profile, which is dominated by texture grade of clay, locally sand clay loams, clay loams, sandy loams or loamy sands.
- Soil depths are very deep.
- Calcium carbonate content ranged 0.6-3.7 % by weight.

- Salinity (EC) and alkalinity (ESP) ranged from 0.6-4.9 dS/m and 2.3-7.9 %, respectively.

It is noteworthy that all the abovementioned soil characteristics have no limitation, except a moderate limitation of soil texture in the sub-deltaic outcrops. Based on that evaluation of the land attributes, the physiographic-soil mapping units could be evaluated as highly suitable classes (S1) for the irrigated agriculture, except for sub-deltaic outcrops, which assessed as moderately suitable classes (S2).

c. Land suitability for specific crops in the dominant physiographic-soil unit:

The land utilization types of trees and herbaceous crops were identified in the studied area according to the concept of **Land Cover Classification System (LCCS, 2004).** Their coverage estimated by the supervised classification for both the two image displays of 1995 and 2007 (Table 2). These crops were evaluated for the specified land attributes according to the crop requirement in the irrigated lands as proposed by **Sys *et al.* (1993)**. The selected crops were categorized and evaluated for the dominant taxonomic soil units of "*Typic Haplotorrerts, clayey*" and "*Leptic Haplotorrerts, clayey over fine loamy*" in the main physiographic unit of alluvial deltaic plain. This crop-land suitability is described as follows:

1. Annual cropped small sized fields (less than 5 feddans) of surface irrigated herbaceous crops as sequential cultivation of summer and winter crops. The field areas cover 25549.8 and 22244.9 feddans in the years of 1995 and 2007 respectively. These areas include cropping patterns of cotton (*Gossypium spp.*), rice (*Oryza sativa*), wheat (*Triticum spp.*), maize (*Zea mays L.*), clover (*Trifolium repens*), pea (*Pisum sativum*), beans (*Phaseolus vulgar*), onion (*Allium cepa*), soya (*Glycine maximum*), green pepper (*Capsicum annum*), tomato (*Solanum esculentum*). It is noteworthy to mention that all the studied crops are categorized into the highly suitable class (S1).
2. Permanently cropped small sized fields of surface irrigated trees crops, covering 23580.5 and 24216.4 feddans in years of 1995 and 2007, respectively. This cropping pattern dominated by citrus (*Citrus spp.*), with a highly suitable class (S1).

Table 2. Monitoring the crop pattern distribution in the studied area

Monitored year	Calculated areas by using the supervised classification on the mask out image for cultivated area				Cultivated area	
	Herbaceos crops		Tree crops			
	Feddans	Hectars	Feddans	Hectars	Feddans	Hectars
1995	25544.9	10731.3	23580.5	9903.5	49131.4	20634.7
2007	22244.9	9342.7	24216.4	10170.7	46461.6	19513.5

d. Profitable specific quality of cotton under soil and environment adaptation:

Most of the urban encroachment is denaturing the annual herbaceous-cropped field. The cropping pattern area, which is dominated by cotton cultivation, decreased from 25549.8 feddans in the year 1995 to 22244.9 feddans in the year 2007, loosing 3304.9 feddans from the herbaceous cropped area (Table 2). About 2668.9 feddans of this crop pattern were urbanized,

while 636.0 detected to be shifted for horticulture cultivation. This loss is mainly act on cotton cropped area, which considered the most important industrial crop in Egypt. As this cultivated land has been denatured and retreated, cotton cultivation in Egypt is being decreased and not to be compensated in the new reclaimed lands otherwise its specific quality "Extra long staple cotton" will be surely collapse. The yarn, spinning and garment production will be surely affected under uncontrolled source of cotton row materials.

Egyptian cotton (Extra Long Staple and long staple) is one of the best cottons in the world, supporting 50% of the world share in this variety. Cotton cultivation as important prophet for Egypt in terms of value of output, employment and export revenue as a major source of foreign exchange. Cotton lint has earned an average of $197.8 million per year while yarn has earned $161.3 million per annum and employs up to one million farm workers. Employment in the ginning, cotton trading, and spinning industries combined for over 175,000 people **(RATES, 2005)**. The negative effect of the urbanization encroachment can be understood when the farmer decided to sell his cotton field area to be urbanized for gaining very high price. Under this uncontrolled condition, the farmer mental concept can be understood by **Al Khamissi (2008)**, who reported that, a feddan is priced now as LE 150,000 and there are place in the Delta where one feddans is priced at LE 300,000. When a feddan yields 7 kantars, it is sold with net profit of LE 4100. In the 1950s and 1960s, a kantar of cotton was sold for LE 40 when the price of one feddan was LE 100. At that time, by the priced one feddan of cotton yield, two feddans could be bought.

According to **GAIN (2006)**, the textile industry's annual requirement of raw cotton for local mills' averaged between 5.5 and 6 million kentars. The total cotton area in MY 2006/2007 is forecast to be 600,000 feddans (252,000 hectars), compared to 650,000 feddans (273,121 hectars) in MY 2005/2006. Overall, cotton lint yields for the MY 2005/2006 crop averaged 6.5 Kentar lint cotton per feddan. As this quantity was not supplied, importing of cotton expected to increase, which already started to be from Greece and Sudan. According to **RATES (2005),** the number of factories producing fabric in Egypt is over one thousand. Egypt textile exports, ranging from 300 million to 450 million US Dollars per year. 50 years ago the capacity below ginning stands was 12 million kantars and now it is 6 million kantars. This decline is due to the decrease in the planted area. GAIN 2006 reported that, the major edible oil produced in Egypt is cotton-seed oil; that ranges from 58,000 MT to 66,000 MT. In MY 2005/2006, cottonseed meal output decrease by 26 percent from the MY 2004/2005 level. This decrease came as a result of a drop in cotton area and production.

e. The site and situation:

The site is an area that just has the existing environment with its resources, whereas the situation has a relative value. This value can be assessed according to the relationships to the other regions with their different human modes and to extent a site that can be affected by them **(Hemdan, 1970)**. The studied area as a site is highly promising for agricultural purposes. It includes land resources that can be easily utilized by low level of management. The value of this promising area is not only dependent on soils of high qualities, as the best in a site, but also depends on the situation of that

site. This situation is related to a firm approach of keeping the formal demographic attributes of specific accumulated skinless in certain area of Egypt for a unique economical production and development. The local skilled agriculture labor must be considered when landforms are to be cultivated. The ability of man-made action for environmental changes makes it possible for some sites to be more promising areas. In that area, the required capital intensity is not to be high for improving the lands successfully as its minor problem can be overcome by small user in small-scale land tenures. For the new reclaimed areas the agriculture development needs a high capital intensity, which is not easy available for small user that may be obliged to apply the minimum applications or to subject to failure. In addition, the site and the situation of Nile Delta are complementary when its lands are utilized in the Nile Delta, which is centrally situated in Egypt with intensive spidery network of the infra-structure (Figure1) that is extends to the other regions in coastal and desertic inland areas. This situation makes it as valued accessible location to be utilized by easy access to national and international markets.

II. Retreating rate of the cultivated land under the urban encroachment:

The urban encroachment on the Nile alluvium was scanned over Toukh district area, Qalubia province, Egypt. It covers total area as arable land of 55127.2 feddans or 23152.9 hectares. The urban expansion was monitored from the year 1995 to the year of 2007. The land of the Nile alluvium, which should be utilized under cropping demand, was viewed by SPOT4 data as cropped-urbanized land pattern rather than to be normally as cropped-land pattern. The view is clearly appearing in the year 1995, but it has become more calamitous pattern in the last catching up land pattern in year 2007. Figure 3 and Table 3 show that, in the year 1995, urban area covered 3681.1 feddans or 1546 hectares as 6.7 % of the total arable land, extending in the years 2007 to be 6350.1 feddans or 2666.9 hectares as 11.5 % of that total area.

To define the real proportion of the urbanization hazard over the cultivated land, the calculation of the residual cultivated land (the net cultivated area) is necessary, as the rate of urbanization will again proportionally act on this residual cultivated land rather on the total arable land. Accordingly, the sum of the following coverage was calculated:

- Urban area in the year 2007 reached about 6350.1 feddans or 2666.9 hectares.
- The combined coverage in width of 10-45 meters of railways, main roads, and canals of water flows is covering about 1905.4 feddans or 800.2 hectares.
- Bare area of the sub deltaic sediments (not utilized for agriculture) is covering about 410.3 feddans or 172.3 hectares.

Thus, the total area of those scattered portions was 8665.8 feddans or 3639.5 hectares within the arable land. The resultant area is a restricted cultivated land covering about 46461.3 feddans or 19513.4 hectars. Another area includes 5.7 % (2648.2 feddans or 1112.2 hectares) of the resultant area as sub roads and narrow tracks, which are not easy identified in the collective classified area. They were traced for their area estimation in isolated sampled blocks by rather supervised classification to be used as a factor of 5.7 % for this resultant area. These sampled blocks were only including those lines and cultivated areas.

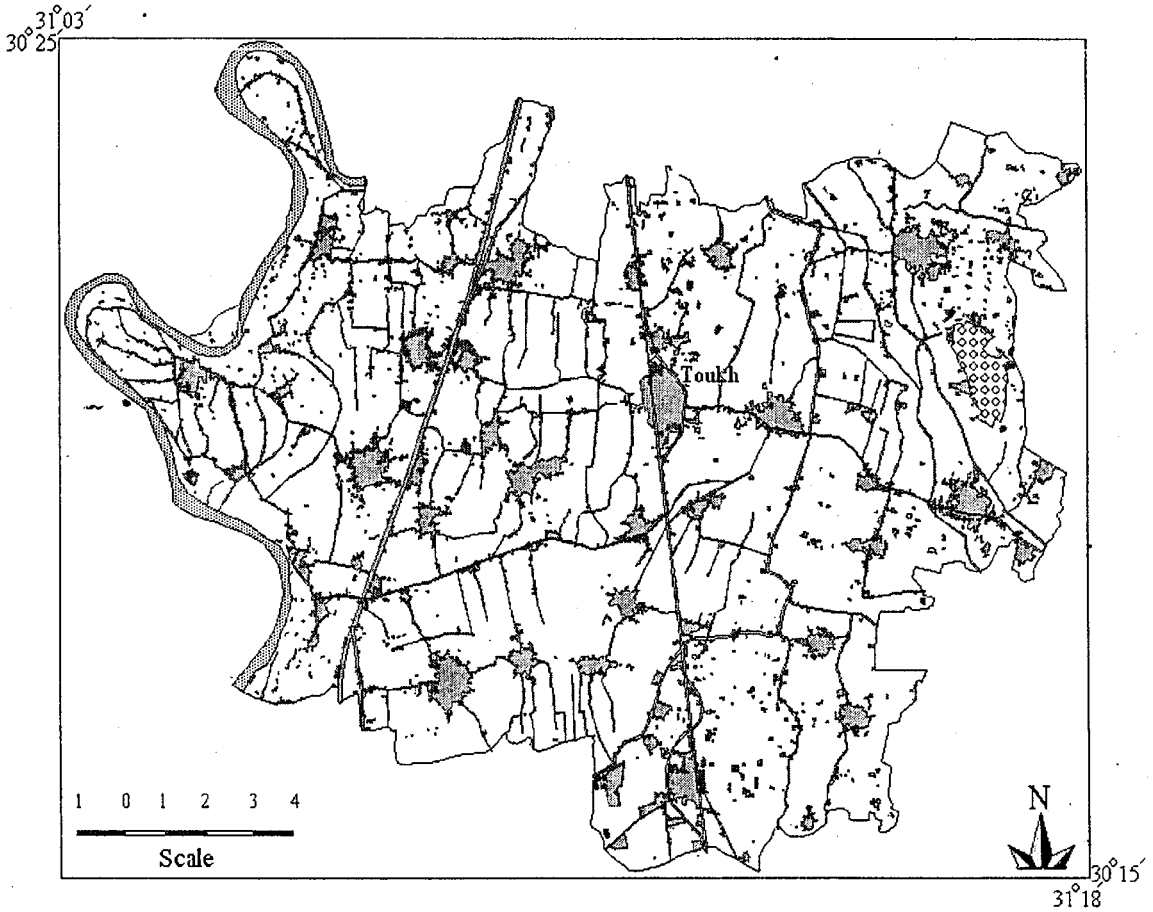


Figure 3. The retreated residual cultivated land between the built up linear and non-linear (urban) area.

Table 3. The retreating rate and the duration of the entire loss of the residual (net) cultivated area.

Total arable land (feddans)	Urbanized area (feddans)		Combined coverage of railways, canals and main roads (feddans)	Bar area, not-agriculture land (feddans)	Cultivated area in 2007 (feddans)
	1995	2007			
55127.5	3681.2	6350.1	1905.5	410.3	46461.6
Factor of sub-roads/cultivated area (feddans)	Residual cultivated area (feddans)		Urbanized area within 12 year (feddans)	Urbanization rate per year (feddans)	Duration of entire loss (year)
5.7 % (2648.2)	43813.1		2668.9	222.4	197

The residual cultivated land (net cultivated area) after using that factor was modified to be 43813.1 feddans or 18401.1hectares. This area is considered the residual cultivated area, which has been attacked again after the year of 2007. Within the duration of 12 years (from 1995 to 2007), 2669 feddans of the cultivated land were urbanized. The retreating rate of the fertile alluvium was 222.4 feddans per year. The integration of yearly loss versus yearly residual cultivated land indicates that the loss will be exaggerated. It can be detected that this cultivated land which is affected by the human mode in the Nile Delta will be completely denatured by the urbanization attack within 197 years, which in turn causes the deformation of demographic features in the Nile Delta alluvium. It is most probably, that if this entire loss is detected in some other areas this rate of loss may be more pessimistic.

RECOMMENDATIONS

1. A definite national public supported decision for keeping the land of the Nile alluvium as protectorate. Also keeping strict monitoring daily view along the constructed new roads, to be rather protectorates under more active control
2. Reform the informal life in the old arable lands by attractive demographic movement from the Nile Delta approached by complementary socio-economical concept. This concept is concerning setting up new societies in productive agriculture land with well structured life parameters keeping the same demographic attributes of the moved society
3. Emphasis the importance of the formal life on a cropped land, correcting the human-land relationship. This relationship is needed to be as a profound part of our culture as it had been well attributed by the ancient Egyptian and has been dawned as conceptual obligations in our religious believes

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تقدير معدل انحسار الأراضى الرسوبية الخصبة فى دلتا نهر النيل تحت الزحف العمرانى باستخدام معلومات الاستشعار من البعد ونظام المعلومات الجغرافية

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اختيرت منطقة الدراسة فى دلتا نهر النيل ممثلة فى مركز طوخ - محافظة القليوبية – مصر ممثلة فى مركز طوخ وذلك لمتابعة الزحف العمرانى على الأراضى الزراعية وقد أسست الدراسة على معلومات الاقمار الصناعية SPOT4 لعامى ١٩٩٥، ٢٠٠٧. وقد استخدمت نفس معلومات الاقمار الصناعية فى تعريف الوحدات الفيزيوجرافية من أجل تحديد معوقات الإنتاجية من خلال تقييم صفات تربتها، وكذا أجرى تقييمها للزراعة المروية، كما تم تصنيف التربة طبقا لنظام التصنيف الدولى Soil Taxonomy. ولقد اتضح أن الزحف العمرانى قد أدى الى فقد مساحات من أجود الاراضى النهرية الرسوبية نادرة التواجد والتى لايمكن تكوينها بفعل الانسان فى أى موقع آخر من خلال برامج إستصلاح الأراضى الصحراوية، وهذه الأراضى ذات صلاحية عالية من اجل الزراعة المروية وتضم الوحدات التصنيفية الآتتية: *Typic Haplotorrerts, clayey* والتى تكونت فى السهل الدلتاوى الرسوبى ويتخللها *Leptic Haplotorrerts, clayey over fine loamy* وكذا *Typic Torriorthents, fine loamy* والتى تكونت فى الأكتاف التهرية ويتخللها الوحدة *Typic Torriorthents, fine loamy over coarse loamy* والتى تكونت فى القواطع الهلالية والبروزات التحت دلتاوية المنزرعة *Typic Torriorthents, coarse loamy over sandy* وكذا *Typic Torriorthents, sandy* والتى تكونت فى القواطع الهلالية والبروزات التحت دلتاوية الغير منزرعة. كما أجرى تحديد درجة صلاحية الوحدة الرئيسية (السهل الدلتاوى الرسوبى) لكل محصول على حدة والتى تضم المحاصيل الشائع زراعتها بمنطقة الدراسة حيث وجد أن هذه الاراضى ذات درجة عالية الصلاحية لكل المحاصيل، كما اتضح أن التاثير السلبى للزحف العمرانى قد تركز على المساحات التى تستخدم فى الزراعة الحولية حيث فقد ما يقدر بـ ٣٣٠٤,٩ فدانا مما أدى الى نقص فى المساحات المنزرعة بمحصول القطن أمام هدا الزحف لكونه أحد الحاصلات التى تسود فى الزراعة الحولية.

ونظرا لتوافق زراعة الاقطان طويلة التيلة مع صفات التربة وكذا عناصر البيئة بمنطقة الدراسة، فان هذه الميزة النوعية قد تأثر إنتاجها سلبيا تحت هذا الزحف العمرانى مما أدى الى نقص فى التصدير وعميات الحلج والغزل والنسيج. كما يضيف مكان وموقع منطقة الدراسة أهمية خاصة تتعلق بتواجد عمالة ذو كفاءة عالية فى مجال الزراعة، كما أنها تقع فى مركز محورى لعديد الطرق الواصلة الى كل أنحاء البلاد، وقد قدرت المساحات التى فقدت كنتيجة للزحف العمرانى فى عام ١٩٩٥ بحوالى ٣٦٨١,٢ فدان بما يعادل ١٥٤٦,١ هكتار من مساحة كلية تقدر بحوالى ٥٥١٢٧,٢ فدان بما يعادل ٢٣١٥٣,٠ هكتار، بينما قدرت المساحة التى فقدت نتيجة الزحف العمرانى حتى عام ٢٠٠٧ بحوالى ٦٣٥٠,١ فدان بما يعادل ٢٦٦٦,٩ هكتار، وقد بلغ إجمالى المساحات التى فقدت من الأراضى النهرية الخصبة ٢٦٦٨,٩ فدان على مدى ١٢ عاما بما يعادل ١١٢٠,٩ هكتار بمعدل ٢٢٢,٤ فدان فى العام. وقد اظهرت الدراسة أنه اذا استمر الفقد فى الأراضى الزراعية تحت الزحف العمرانى بهذا المعدل فانه من المتوقع ضياع الأراضى الزراعية فى خلال ١٩٧ عام، كما سوف يصاحب ذلك تدهور فى السمات الديموجرافية لدلتا نهر النيل، وبناء على ذلك فان الدعوة الى جعل مناطق الترسيبات النهرية كمحمية طبيعية اصبحت ضرورة ملحة لما تمثله من أهمية كبيرة فى الإنتاج الزراعى ومن ثم الإقتصاد القومى.