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SPATIAL AND TEMPORAL CHANGES IN AGRICULTURAL LANDS EASTERN NILE-DELTA, EGYPT

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ABSTRACT

Fertile agriculture areas in the Nile-Delta of Egypt are constantly deteriorating mainly due to urbanization. Providing up to date and accurate estimation of existing agricultural lands in Egypt is a necessity to support decision makers with the right information about the agriculture sector. The objectives of this study were to provide an accurate estimation of agricultural lands eastern Nile-Delta and to study the impact of urbanization on agricultural lands from 1984 to 2010. Accordingly, Landsat TM images in 1984 and ETM+ in 2002 and 2010 were used to study spatial and temporal changes in agricultural lands eastern of Nile-Delta. Normalized difference vegetation difference (NDVI) was used to map agricultural versus non - agricultural lands. Results indicated that agricultural lands were about 1.729, 1.831, and 1.732 million acres in 1984, 2002 and 2010, respectively. Annual increase in agricultural lands was about 5,637 acres per year during the period from 1984 to 2002; this was followed by an annual decreased of 12,309 acres per year during the period from 2002 to 2010. However, there was an annual increase in agricultural land by 115 acres per year during the whole studied period from 1984 to 2010.

Significant reduction was observed in agricultural areas in Dekernis and Al-Zagazig cities that are completely surrounded by agricultural lands due to urban encroachment. Agricultural land was reduced in 26 years by about 45 and 50% in Al-Zagazig and Dekernis cities, respectively. The reduction rate in agricultural land from 1984 to 2002 was lower than that between 2002 and 2010 in both cities. On the other hand, agricultural land around Abohammad city located at the fringe of eastern Nile-Delta was increased by about 425% from its original area in 26-years from 1984 to 2010 due to agriculture reclamation projects. It could be concluded that urban encroachment over the fertile agricultural lands is the most serious process that result in fertile land degradation eastern of Nile-Delta in Egypt.

Keywords: Land cover, land use, NDVI, change detection, urbanization, Remote sensing, GIS

INTRODUCTION

The agricultural sector is one of the main sources of national income in Egypt, where it contributes by about 20% from country's entire GDP. It also accommodates about 34% of the total labor force. The population of Egypt is reaching about 85 millions most of this population is concentrated in the Nile-Delta and Valley, which represent about 4% of the total area of Egypt (1 million km^2). Those areas are the most fertile soils in Egypt, where they developed on alluvial deposits derived from Ethiopia plateau. Both rapid increase in population and economic development put lots of pressure on these fertile agricultural lands. Consequently, urbanization represents the major threat for losing these old highly fertile agricultural lands, especially in Nile-Delta and valley. The government of Egypt has established legislations that forbid building on agricultural lands; however people continue violating the law.

In the last two decades Egypt has launched a number of mega agricultural expansion projects; which would contribute to the addition of 1.37 million acres. These projects are expected to increase the total inhabited area of Egypt from 5.5% to 25%. Also, it will redraw the demographic map of Egypt after creating new urban communities in the depths of the desert areas. El-Salam canal project is one of these projects eastern Nile-Delta. Currently, there is a need for an effective, accurate, and economic approach to monitor spatial and temporal changes in agricultural lands eastern of Nile-Delta in Egypt. This is to provide decision makers with reliable information in order to establish rational land use policies.

Nowadays, remote sensing data play an important role in assessing and monitoring the environment and its components. Monitoring land use changes over time is required in order to determine trends in land conditions. In other words, are these conditions becoming worse, better, or staying the same. Change detection involves the use of multi-temporal datasets to quantitatively analyze the temporal effects of the phenomenon (Lu et al, 2003). RTO (2007) reported four important aspects in change detection when monitoring naturally occurring phenomena. These aspects are: detecting the changes that have occurred, identifying the nature of the change, measuring the real extent of the change, and assessing the spatial pattern of the change. Effective indicators of change detection should be quantitative, sensitive to small changes, few in number, and simple to measure. One of the most commonly used techniques in studying temporal changes in vegetation cover, is differencing in vegetative indices (Mas, 1999; Nagler et al., 2005; and Jiang et al., 2006). Rouse et al. (1974) initially proposed the Normalized Difference Vegetation Index (NDVI). The NDVI is derived from the ratio of band 3 and band 4 in Landsat TM and ETM+ images data. Early studies using Landsat MSS indicated that NDVI correlates significantly with the amount of green leaf biomass (Tucker 1979).

Land cover changes in Egypt were assessed using field calibrated, multi-temporal NDVI features derived from 10 Landsat TM images from 1984 to 1993 (Lenney et al., 1996). Sadek (1993) used satellite imagery to estimate the total expansion of the cultivated land east and west of the Nile-Delta. High rates of reclamation were observed during the period from 1986 to 1993, whereas low rates of conversion from agricultural productive land to newly urban areas were noticed from 1984 to 1990. Quantitative assessment of land degradation and changes of soil quality in Kafr EL-Sheikh governorate in Egypt between1963 to 2009 was studied using aerial photograph and ETM+ data (Darwish and Abdel Kawy, 2008). It was found that most degradation was human induced. Shalaby and Gad (2004) studied the impact of urban sprawl on the fertile agricultural land in Qalubiya governorate of Egypt using remote sensing and digital soil database. Shalaby and Ali (2010) used two NOAA-AVHRR and SPOT images to monitor agricultural areas in Egypt from 1992 to 2000. An inventory of agricultural land area of Egypt was also done using vegetation indices (MOD13Q1) produced by MODIS

(Hereher, 2009). Fadhil (2009) applied the NDVI to study deterioration in vegetation cover /changes in land cover in some sites of Iraq.

This work aimed to employee technical advantages of using RS and GIS data and techniques in estimating spatial and temporal changes in agricultural lands eastern Nile-Delta between 1984 and 2010 and to highlight those areas highly affected by urban encroachment.

MATERIALS AND METHODS

Description of the studied area

Studied area is located eastern of Nile-Delta in Egypt between these coordinates 31^o 1' 52.31" E, 31^o 38' 0.80" N and 32^o 38' 45.32" E, 30^o 0' 36.11" N, as represented in Figure 1. It covers an area of about 17,500 km^2. Maximum temperature in the studied area varies from 35.3 ^{o}C in summer to 20.1 ^{o}C in winter. Minimum temperature ranges between 20.2 ^{o}C in summer and 7.5 ^{o}C in winter. Total precipitation varies from 29.2 to 72.3 mm. Elevation varies from 0 to 711 m above the sea level. Geology of the studied area includes Nile-deposits, sabkha-deposits, and sand dunes (CONOCO, 1989). Vegetation varies from major field-crops growing in the summer season such as rice, cotton, maize to vegetables such as tomato, potato, and cucumber. This is in addition to fruit trees such as orange and mango.

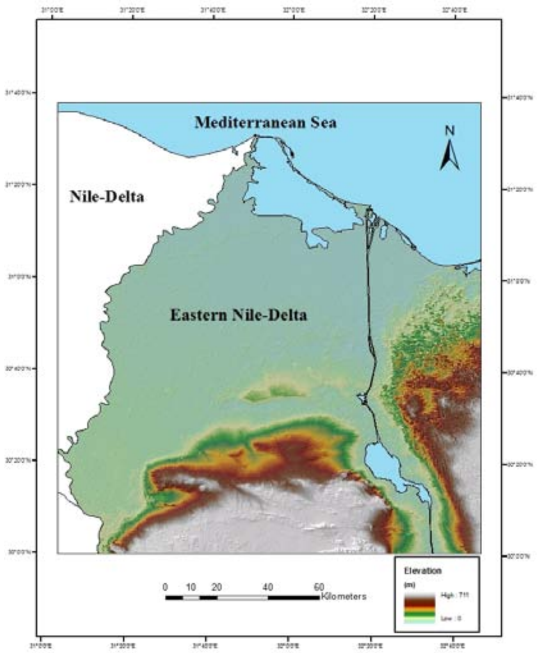

Figure 1. Location and topographic characteristics of the studied area.

Landsat Data

Studied area is covered by two Landsat images (path 176, row 38 and 39). A total of six Landsat images were used to study the spatial and temporal changes in agricultural lands at the eastern Nile-Delta during 1984, 2002 and 2010, where each year was represented by two images. Landsat images were downloaded from the earth explorer website developed by the United States Geological Survey (USGS): http://earthexplorer.usgs.gov/. Most of agriculture lands in Egypt are intensively grown, which insures an existence of vegetation cover all over the year. However, all the studied images were acquired during the summer season, where vegetation cover is at its maximum peak. This is also to guarantee cloud free images, where clouds are prevalent during the winter season.

It is well known that Landsat ETM+ data acquired after May 31, 2003 experience a Scan Line Corrector (SLC) failure. Accordingly, gaps in Landsat images acquired in 2010 were filled using a free program called frame_and_fill Ver. 1.0, which is distributed by NASA (program can be downloaded from: www.geoinformatic.org/files/Landsat7GapFill.zip). The program employs a histogram-based compositing algorithm designed to combine an SLC-off image with one or more SLC-off and/or SLC-on scenes. Each image was filled using four scenes acquired during the same season.

Digital image processing

Studied images were atmospherically and radiometrically corrected to eliminate the atmospheric interferences (dust, haze, smoke, etc) by using the dark-object subtraction method in Envi software package. Data were converted from DN values to reflectance. All images were projected to have the same projection (UTM, Zone 36N, Datum WGS 1984) and the same pixel size 30 m. The two images for each year were mosaicked to form a single image using a histogram matching and stitching processes. Each mosaiced image for each date was subsetted to cover the eastern of Nile-Delta and its outer edges.

Normalized Difference Vegetation Index (NDVI) was calculated as (NIR-Red) / (NIR+Red) (Rouse et al. 1974), where, NIR is the reflectance in the near infrared portion of spectrum and Red is the reflectance in the red portion of spectrum. NDVI values range between -1.0 to +1.0, where positive values indicate healthy green vegetation and near zero or negative values represent non-vegetated land-covers such as urban areas, deserts and water bodies. The NDVI algorithm was applied to mosaics of 1984, 2002 and 2010 reflectance images. Image processing techniques were carried out using both ERDAS Imagine 9.1 and Envi 4.2 Software packages.

Estimation of Horizontal Expansion in Agricultural Lands

Each NDVI image was visually inspected to come up with a threshold value that accurately distinguishes agriculture from non-agriculture land-covers. Many points, especially at the boundaries of urban areas and Nile-delta were investigated for that purpose. Critical threshold values for the 1984, 2002 and 2010 images were 0.26, 0.22 and 0.16, respectively. Soon after the threshold value was determined for each NDVI image a binary or a two-class image was developed for each year. All pixels equal to and/or greater than the threshold value were considered agricultural-land, whereas the remaining pixels were considered non-agricultural lands. Agricultural-land was given the value of one and represented in green color, whereas non-agricultural area was given the value of zero and represented in white color. Total area of agricultural lands in eastern Nile-Delta was calculated from the 1984, 2002 and 2010 NDVI binary images.

Urban encroachment of some cities in eastern Nile-Delta

Three cities in eastern on Nile-Delta were selected in order to evaluate loss of agricultural land due to urban encroachment among the studied years. Two of these cities (Dekernis and Alzagazig) are completely surrounded by agricultural lands, whereas the third city (Abohammad) is located at the fringe of eastern Nile-Delta. Urban encroachment was estimated based on the diminishing of agricultural lands around these major cities. Equal subset images within the three binary NDVI images of 1984, 2002 and 2010 were created for each city to assess changes in urban and agricultural lands between 1984-2002, 1984-2010 and 2002-2010.

Change Detection of Agricultural lands

Change detection was developed by subtracting the NDVI binary image for each two successive years. A three-class image (+1, 0, and -1) was obtained; where Positive value (+1) indicates positive changes toward agricultural lands, zero indicates no changes in land-use, and negative value (-1) indicates negative changes from agriculture to non-agriculture activities. The objective of applying change detection was to locate areas of urban encroachment (negative changes) and area of land reclamation and cultivation projects eastern of Nile-Delta (positive changes).

RESULTS AND DISCUSSION

Aerial expansion of agricultural lands eastern Nile-Delta

Aerial expansion of agricultural lands eastern Nile-Delta in 1984, 2002, and 2010 is represented in Figs. 2, 3, and 4. Estimated agricultural lands were about 1.729, 1.831, and 1.732 million acres in 1984, 2002 and 2010, respectively (Table 1). Agricultural lands were increased by about 101,467 acres in 18 years from 1984 to 2002 with an annual increase of about 5,637 acres per year. However, agricultural lands were decreased by about 98,471 acres in eight years from 2002 to 2010, with an annual decrease of about 12,309 acres per year. Total increase in agriculture land was about 2,997 acres in 26 years from 1984 to 2010, with an annual increase of about 115 acres per year. This increase in agricultural lands was due to the horizontal expansion projects in agricultural lands eastern of Nile-Delta.

Table 1: Areas of agricultural lands eastern of Nile-Delta and their total and annual changes from 1984 to 2010.

Agric. Land in Acre		Change in Agric. Land from 1984 to 2002			
1984	**2002**	**Acre**	**Acre yr^{-1}**	**%**	**% yr^{-1}**
1,729,182	1,830,649	101,467	5,637	5.87	0.33
Agric. Land in Acre		**Change in Agric. Land from 2002 to 2010**			
2002	**2010**	**Acre**	**Acre yr^{-1}**	**%**	**% yr^{-1}**
1,830,649	1,732,178	-98,471	-12,309	-5.38	-0.67
Agric. Land in Acre		**Change in Agric. Land from 1984 to 2010**			
1984	**2010**	**Acre**	**Acre yr^{-1}**	**%**	**% yr^{-1}**
1,729,182	1,732,178	2,997	115	0.17	0.01

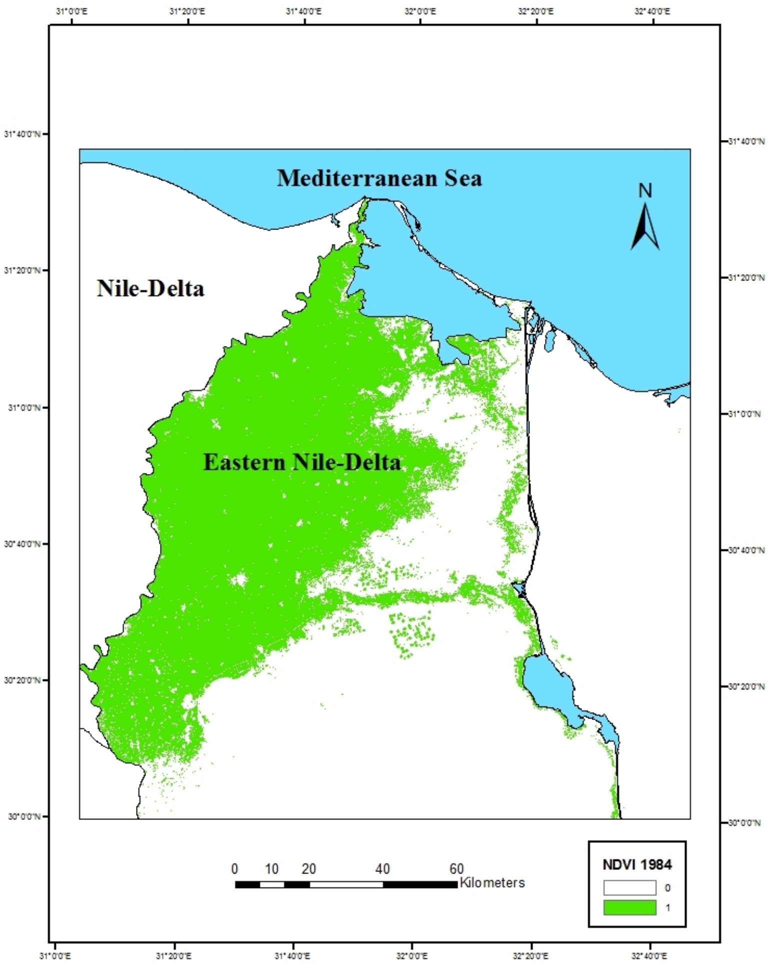

Figure 2. NDVI binary image of eastern Nile-Delta in 1984. (0 indicates non-agricultural areas, whereas 1 indicates agricultural areas).

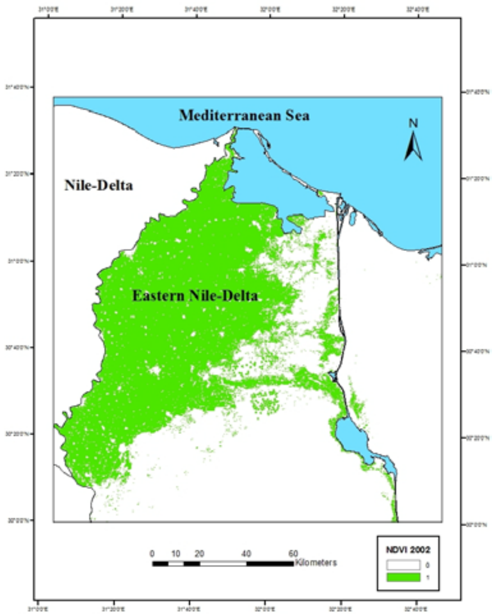

Figure 3. NDVI binary image of eastern Nile-Delta in 2002. (0 indicates non-agricultural areas, whereas 1 indicates agricultural areas).

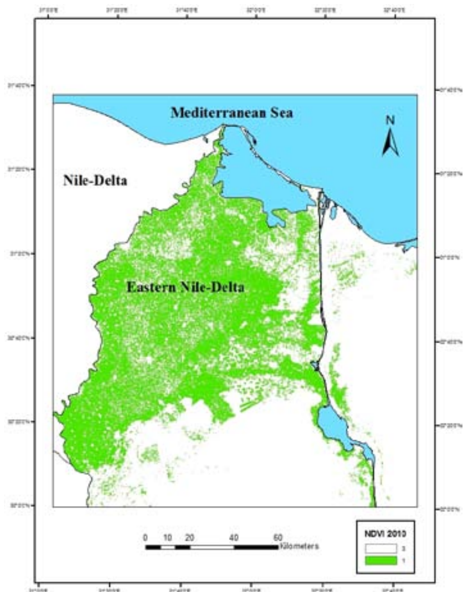

Figure 4. NDVI binary image of eastern Nile-Delta in 2010. (0 indicates non-agricultural areas, whereas 1 indicates agricultural areas).

Changes in agricultural lands eastern of Nile-Delta

Changes in land use from agricultural to non-agricultural activities and vice versa eastern of Nile-Delta between 1984 and 2002 are illustrated in Figure 5. The three-class image indicates that most of the changes from agricultural to non-agricultural activities (-1) took place in soils developed on alluvial deposits from the old deltaic plain. This decrease in agricultural was mostly due to urban encroachment, where most of these areas were clustered around urban areas. On the other hand, changes from non-agricultural to agricultural activities (+1) took place at the fringes of the studied area, along Ismailia canal, and along the eastern side of Suez Canal. This is mostly due to agricultural expansion projects eastern of Nile-Delta. Positive changes in agricultural lands between 1984 and 2002 represented about 217,020 acres, whereas negative changes represented about 115,553 acres. The difference between positive and negative changes was about 101,467 acres for agricultural lands.

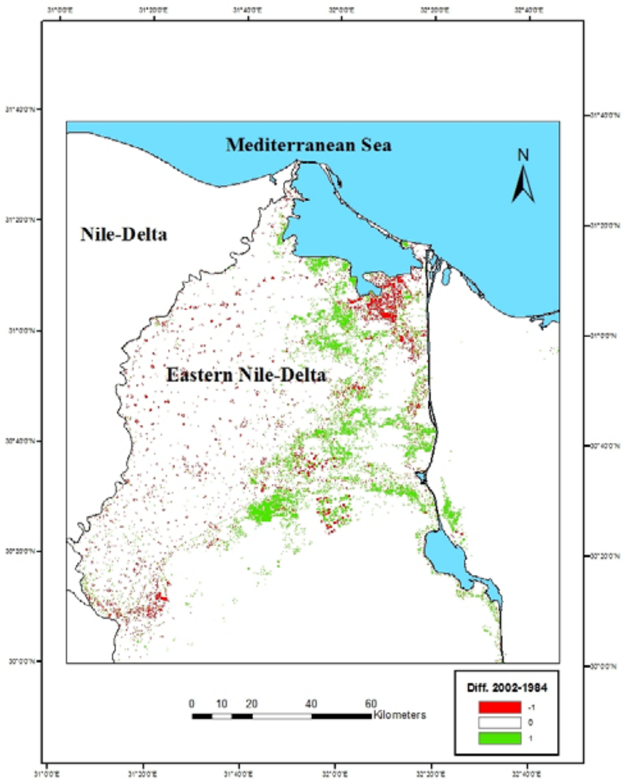

Figure 5. Changes in land use from agricultural to non-agricultural activities eastern of Nile-Delta between 1984 and 2002. (+1 indicates positive changes toward agricultural lands, Zero indicated no changes in land-use, and -1 indicates negative changes from agriculture to non-agriculture activities).

Changes in land use from agricultural to non-agricultural activities and vice versa eastern of Nile-Delta between 2002 and 2010 are illustrated in Fig 6. Positive changes represented about 301,004 acres, whereas negative changes represented about 399,474 acres. The difference between positive and negative changes was about 98,471 acres for non-agricultural activities.

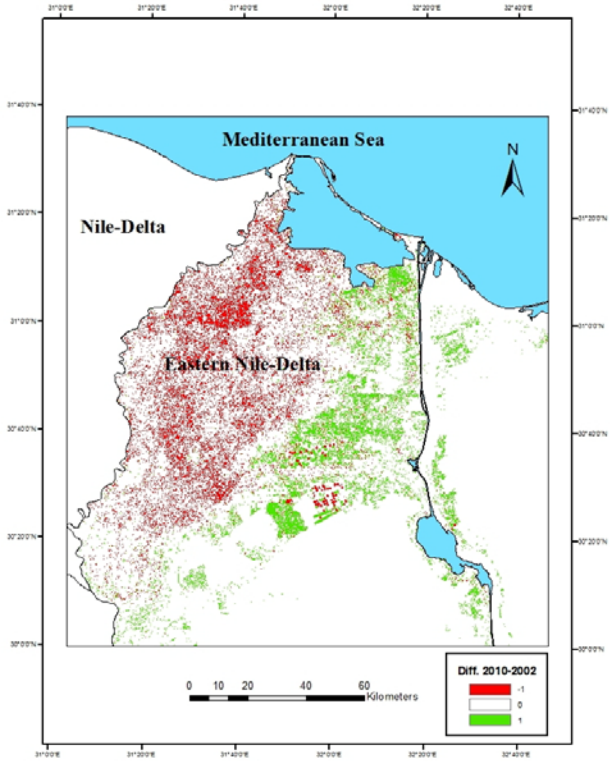

Figure 6. Changes in land use from agricultural to non-agricultural activities eastern of Nile-Delta between 2002 and 2010. (+1 indicates positive changes toward agricultural lands, Zero indicated no changes in land-use, and -1 indicates negative changes from agriculture to non-agriculture activities).

Changes in land use from agricultural to non-agricultural activities and vice versa eastern of Nile-Delta between 1984 and 2010 are illustrated in Figure 7. Positive changes represented about 437,026 thousand acres, whereas negative changes represented about 434,030 thousand acres. The difference between positive and negative changes was about 2,997 acres for agricultural activities.

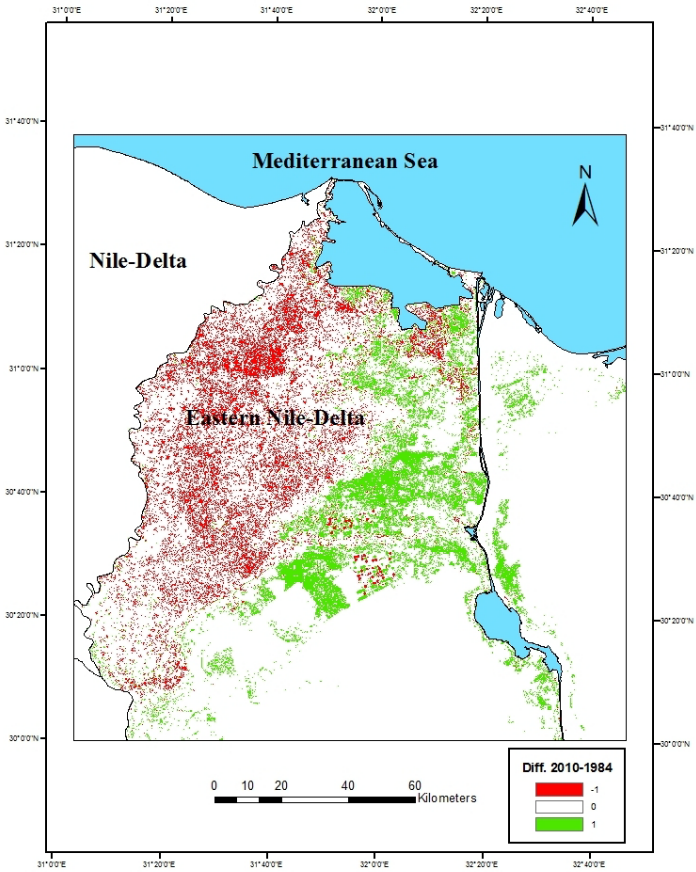

Figure 7. Changes in land use from agricultural to non-agricultural activities eastern of Nile-Delta between 1984 and 2010. (+1 indicates positive changes toward agricultural lands, Zero indicated no changes in land-use, and -1 indicates negative changes from agriculture to non-agriculture activities).

Impact of urban encroachment on agricultural lands

Aerial Expansion of agricultural lands from 1984 to 2010 in Dekernis and Al-Zagazig cities, which are completely surrounded by agricultural lands, is illustrated in Figures 8 and 9 (the top three binary images). These figures also represent changes in land use from agricultural to non-agricultural activities resulted from urban encroachment between each two consequent years (the bottom three-class images). Estimated values of agricultural lands and their changes in Dekernis, Al-Zagazig, and Abohammad from 1984 to 2010 are represented in Table 2.

Table 2: Change in agricultural lands in certain cities located eastern Nile-Delta from 1984 to 2010.

City	Agric. Land in Acre		Change in Agric. Land from 1984 to 2002			
	1984	2002	Acre	acre yr^{-1}	%	% yr^{-1}
Dekernis	3,010	2,675	-335	-18.6	-11.13	-0.62
Al-Zagazig	4,546	3,710	-836	-46.4	-18.39	-1.02
Abohammad	2,479	12,489	10,010	556.1	403.79	22.43
City	**Agric. Land in Acre**		**Change in Agric. Land from 2002 to 2010**			
	2002	**2010**	**Acre**	**acre yr^{-1}**	**%**	**% yr^{-1}**
Dekernis	2,675	1,498	-1,177	-147.1	-44.00	-5.50
Al-Zagazig	3,710	2,511	-1,199	-149.9	-32.32	-4.04
Abohammad	12,489	13,010	521	65.1	4.17	0.52
City	**Agric. Land in Acre**		**Change in Agric. Land from 1984 to 2010**			
	1984	**2010**	**Acre**	**acre yr^{-1}**	**%**	**% yr^{-1}**
Dekernis	3,010	1,498	-1,512	-58.2	-50.23	-1.93
Al-Zagazig	4,546	2,511	-2,035	-78.3	-44.76	-1.72
Abohammad	2,479	13,010	10,531	405.0	424.81	16.34

Both Dekernis and Al-Zagazig cities showed significant reduction in agricultural areas due to urban encroachment; however Dekernis city had the highest rate of change. Agricultural areas in Dekernis city was reduced by about 335 acres (about 11% of its area in 1984) in 18 years from 1984 to 2002, with a reduction rate of about 18.6 acres per year. In Al-Zagazig city, agricultural areas was reduced by about 836 acres during the same period (about 18.4% of its area in 1984), with a reduction rate of about 46.4 acres per year. During the period from 2002 to 2010, agricultural areas in Dekernis city was reduced by about 1,177 acres (about 44% of its area in 2002), with a reduction rate of about 147 acres per year. Agricultural areas in Al-Zagazig city was also reduced by about 1,199 acres (about 32.3% of its area in 2002), with a reduction rate of about 150 acres per year. It was noticed that the rate of reduction in agriculture land from 1984 to 2002 was lower than that between 2002 and 2010 for both cities, which could be due to the increase in population and economic activities.

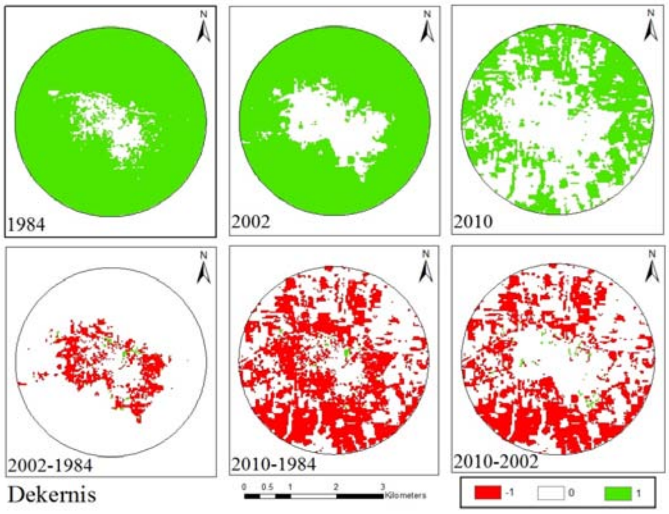

Figure 8. Aerial Expansion of agriculture land of Dekernis city in 1984, 2002 and 2010 (top thee figures, respectively), and changes in land use from agricultural to non-agricultural activities between consequent years.

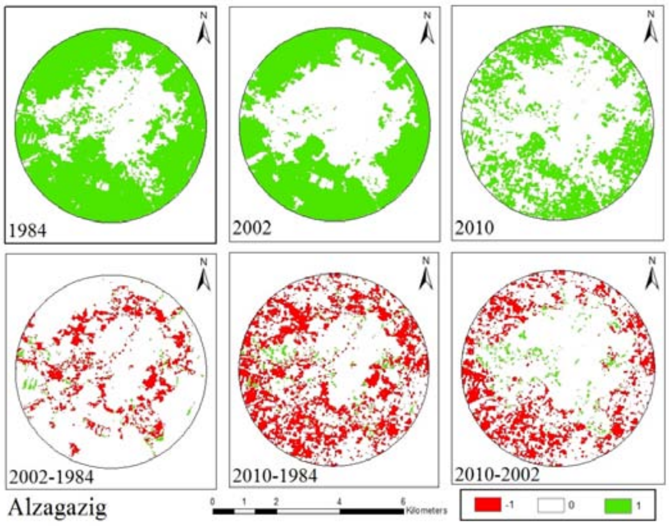

Figure 9. Aerial Expansion of agriculture land of Al-Zagazig city in 1984, 2002 and 2010 (top thee figures, respectively), and changes in land use from agricultural to non-agricultural activities between consequent years.

The total reduction in agricultural areas from 1984 to 2010 was about 1,512 acres in Dekernis city (about 50.2% of its area in 1984), with a reduction rate of about 58.2 acres per year. Agricultural areas in Al-Zagazig city was also reduced by about 2,035 acres (about 45% of its area in 1984), with a reduction rate of about 78.3 acres per year.

Changes in land use from agricultural to non-agricultural activities at the boundaries of Abohammad district between 1984 and 2010 are illustrated in Figure 10. The represented area was selected to show aerial expansion in agricultural land at the fringes eastern Nile-Delta. In contrast to what we saw in previous cities, agricultural areas at Abohammad boundaries increased by about 10,000 acres (about 404% of its area in 1984) from 1984 to 2002, with a rate of change 556 acres per year. This area was increased by about 521 acres from 2002 to 2010 (about 4% of its area in 2002), with a rate of change 65 acres per year.

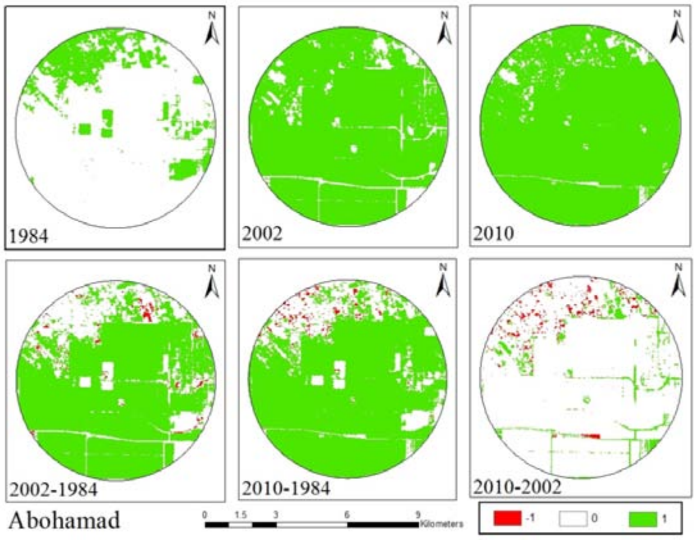

Figure 10. Aerial Expansion of agriculture land of Abohamad district in 1984, 2002 and 2010 (top thee figures, respectively), and changes in land use from agricultural to non-agricultural activities between consequent years.

The total increase in agricultural areas at Abohammad district from 1984 to 2010 was about 10,530 acres (about 425% of its original area in 1984), with an increase rate of about 405 acres per year. This significant increase in agricultural land at the fringes eastern Nile-Delta was mainly due to land reclamation projects.

CONCLUSION

It could be concluded that remote sensing data can provide recent, accurate, less expensive and time-wise information about changes in land use and land cover. Changes in agricultural lands were very active eastern of Nile-Delta mainly due to urbanization and land reclamation projects. Most of the changes in agricultural lands due to urbanization took place on soils developed on the alluvial deposits, which are considered fertile soils. On the other hand, the increase in agricultural areas resulted from land reclamation occurred on soils developed on aeolian deposits and sabkhs, which are low in their fertility. In addition, these soils require special management practices such as particular irrigation and fertilization system. Also, these soils do not grow all crops cultivated in alluvial soils, especially strategic crops such as rice (Oriza sativa), due to their physical properties. Agricultural lands eastern of Nile-Delta decreased from 1.83 million acres in 2002 to 1.73 million acres in 2010 mostly due to urban encroachment. In contrary, the rate of reclamation process declined in the last few years. More efforts are needed to protect these highly-fertile lands developed on alluvial deposits, build new cities and reclaim new agricultural lands at the fringes of Nile-Delta.

REFERENCES

Abahussain, A.A., Abdu, A.S., Al-Zubari, W.K., El-Deen, A.N., and Abdul-Raheem, M. 2002. Desertification in the Arab region: analysis of current status and trends. Journal of Arid Environments 51: 4, 521-545.

Conoco 1989, Stratigraphic lexicon and explanatory notes to the geological map of Egypt 1:500,000. Conoco Inc., Cairo, Egypt, 1989.

Darwish, Kh.M., and Abdel Kawy, W.A. 2008. Quantitive Assessment of Soil Degradation in some Areas North Nile Delta, Egypt. International Journal of Geology, Issue 2, Vol. (2), pp: 17-22.

Fadhil, A.M. 2009. Land Degradation Detection Using Geo-Information Technology for Some Sites in Iraq. Journal of Al-Nahrain University, Vol.12 (3), pp. 94-108.

Hereher, M.E. 2009. Inventory of agricultural land area of Egypt using MODIS data. Egypt. J. Remote Sensing & Space Sci., 12, 179-184.

Jiang, Z.Y., Huete, A.R., Chen, J., Chen, Y.H., Li, J., Yan, G.J., Zhang, X.Y. 2006. Analysis of NDVI and scaled difference vegetation index retrievals of vegetation fraction. Remote Sens. Environ., 101(3), 366-378.

Lenney, M.P., Woodcock, C.E., Collins, J.B., and Hamdi, H. 1996. The status of agricultural lands in Egypt: The use of Multi temporal NDVI features derived from landsat TM. Remote Sens. Environ., 56, 8-20.

Lu, D., Mausel, P., Brondi Zio, E., Moran, E. 2003. Change detection techniques. Int. J. Remote Sensing, 25(12) 2365–2407.

Mas, J.F. 1999. Monitoring land-cover changes: a comparison of change detection techniques. Int. J. Remote Sensing, 20(1) 139-152.

Nagler, P., Glenn, E., Hursh, K., Curtis, C., Huete, A. 2005. Vegetation mapping for change detection on an arid-zone river. Environmental Monitoring and Assessment, 109, 255-274.

Rouse, J., Has, R., Schell, J., Deering, D. 1974. Monitoring vegetation systems in the Great Plains with ERTS. Proceedings, Third Earth Resources Technology Satellite-1 Symposium, Greenbelt: NASA SP-351, pp. 3010 - 3017.

RTO 2007. NATO RTO Space Science and Technology Advisory Group (SSTAG) Recommendations for Space Research Topics". RTO Technical Memorandum, TM-SPD-002.

Sadek, S.H.A. 1993. Use of landsat imagery for monitoring agricultural expansion of east and West Nile Delta, Egypt. Egyptian J. Soil Sci., 33(1) 23-24.

Shalaby, A., and Ali, R.R. 2010. Agricultural land Monitoring in Egypt using NOAA-AVHRR and SPOT Vegetation Data. Nature and Science, 8(11) 275-278.

Shalaby, A., and Gad, A. 2004. Urban Sprawl Impact Assessment on the Fertile Agricultural Land of Egypt Using Remote Sensing and Digital Soil Database, Case study: Qalubiya Governorate. US-Egypt Workshop on Space Technology and Geo-information for Sustainable Development, 14-17 June, Cairo, Egypt.

Tucker, C.J. 1979: Red and photographic infrared linear combinations for monitoring vegetation. Remote Sens. Environ., (8) 127–150.

التغيرات المكانية والزمانية فى الأراضى الزراعية شرقى دلتا النيل فى مصر

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تتعرض الأراضى الزراعية الخصبة في دلتا النيل بمصر للتدهور بشكل مستمر ويرجع ذلك بشكل أساسى إلى التوسع العمرانى. ويعتبر الحصول على بيانات حديثة ودقيقة عن الأراضي الزراعية الحالية في مصر فى غاية الأهمية لدعم متخذى القرار بالمعلومات الصحيحة عن القطاع الزراعي. وتهدف هذه الدراسة الى تقديم تقدير دقيق للأراضي الزراعية شرقى دلتا النيل ودراسة تأثير التوسع الحضري على الأراضي الزراعية فى الفترة من 1984 حتي 2010. وفقا لذلك، استخدمت صور لاندسات TM فى عام 1984 وصور ETM+ في أعوام 2002 و 2010 لدراسة التغيرات المكانية والزمانية في الأراضي الزراعية شرقى دلتا النيل. وتم استخدام مدلول التغير فى الغطاء النباتى NDVI لتعيين الأراضى الزراعية فى مقابل الأراضي غير الزراعية. وأشارت النتائج إلى أن مساحة الأراضي الزراعية كانت حوالي 1.77، 1.90 ، 1.81 مليون ايكر في أعوام 1984 ، 2002 ، 2010 على التوالي. وكان الزيادة السنوية في الأراضي الزراعية حوالي 7 آلاف ايكر سنويا خلال الفترة من 1984 إلى 2002؛ أعقب ذلك انخفاض سنوي حوالي 11 ألف ايكر سنويا خلال الفترة من 2002 إلى 2010. ومع ذلك كانت هناك زيادة سنوية في الأراضي الزراعية بنحو 1.5 ألف ايكر سنويا خلال فترة الدراسة الكلية من 1984 حتي 2010.

ولوحظ انخفاض كبير في الأراضى الزراعية في كلا من مدينتى دكرنس والزقازيق واللتان تحيطهما الأراضي الزراعية بشكل تام وذلك بسبب الزحف العمراني. حيث انخفضت الأراضي الزراعية خلال 26 عاما بحوالى 45 و 50٪ في مدينة الزقازيق ومدينة دكرنس، على التوالي. وكان معدل الانخفاض في الأراضي الزراعية فى الفترة من 1984 حتي 2002 أقل منه فى الفترة بين عامي 2002 و 2010 في كلا من المدينتين. من ناحية أخرى، زادت مساحة الأراضي الزراعية حول مدينة أبو حماد والتى تقع على الهوامش شرقى دلتا النيل بنحو 425% من مساحتها الأصلية في 26 سنة من 1984 حتي 2010 بسبب مشاريع استصلاح وزراعة الأراضى.

ونستخلص من ذلك أن الزحف العمراني على الأراضي الزراعية الخصبة هي أخطر العمليات التي تؤدي إلى تناقص الأراضي الخصبة شرقي دلتا النيل في مصر

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