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Using GIS And Satellite Image To Determine The Administrative Limits, Area And Sites Of Rice Straw

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ABSTRACT

In the present study, rice straw was selected as the main crop residues that cause environmental problems in Egypt. Geographic information systems and satellite image as represent new technologies that contributed in solving these problems. Dakahleia is one of the Famous governorates for cultivating rice crop with around rice crop area of 350661 Fadden. Sinbilawin is the biggest center in Dakahleia governorate for planting rice which represents about 13.5 % in rice production from total production in Dakahleia area. For the previous reasons Dakahleia and Sinbilawin were selected for this study. From Google Earth -The administrative limits of Dakahlia governorate is locating at El-Shrqia governorate east, El-Gharbia governorate west, the Mediterranean Sea north and El-Qaliopia governorate south. It is lies between 31° 29' 28.75" E longitude and 31° 4' 59.53" N latitude. Snplawein is bounded to the east by the Timai El-Amded city, west by the Aga city, north by the Mansoura city and to the south by the Diarb Negm city. It located between 31° 27' 38.07" E longitude and 30° 53' 1.55" N latitude. The ENVI program has been used to separate layers as road, urban, canal, and place it in a file which named (shp file). The results from satellite image, ENVI and ArcGIS programs for Sinbilawin center were appeared 97 villages on the Sinbilawin map, total area of rice was 34078.12 fed. and total rice straw was 59350.457 ton. Also, From ArcGIS program different layers were determined as layer of roads, canal, drainages, urban, layer of areas, and layer of sides.

INTRODUCTION

In recent years, the civilized world and developed countries have been turned to solve their problems of life and environmental problems by using the technological systems and Geographic Information Systems (GIS). Agricultural residues are becoming one of the main problems in Egypt. Geographic information systems as the new technology shall be contributed to solve this problem. During the past decade rapid development occurred in recycling of agricultural residues. Because of that environmental pollution reduced. Recycle can be relied upon to decrease the environmental pollution and improve the national income. Mazaher (2010) reported that the use of GIS is not only ideal for reducing the time and cost of site selection, but also provides a digital data bank for long-term and beneficial monitoring of sites. Moustafa *et al.* (2013) reported that more importantly, one of the most difficult issues is being faced here in Egypt is not having a reliable digital map of the roads, services and facilities for each city in Egypt, which makes the GIS advanced technologies difficult to apply. Consequently, huge amount of geocoding efforts was done in this work to bring the map used in this work live and usable. The objective is to use GIS and vehicle routing models to develop improved waste collection plans that will increase the efficiency of collection and yet reduce the cost in travel distance and time. Sule *et al.* (2014) said that waste management is a global environment issue which constitutes a very significant problem in today's world. There is a considerable amount of waste disposal without proper segregation which is leading to both economic and environmental problems. There is tremendous amount of loss in terms of environmental degradation and health hazards, due to direct disposal of waste. There has to be appropriate planning for good waste management by assessing the waste situation of the area. Elfeki and Tkadlec (2015) has been estimated that the present demand for compost is around 53 million ton annually for the old Nile Valley land and 1.5 million ton per year for reclaimed land. The demand for compost for reclaimed desert land is expected to reach at least 30 million ton by 2017. With the present national production capacity of compost being only about 20.7 million ton per year, there is clearly a major shortage in the supply of compost. Amjad Kallel *et al.* (2016) stated that the experiment is therefore to achieve optimal waste collection and transport operation (hauling, equipment, manipulation, etc.), the development of an optimal collection/transportation system for the determination of a number of selection criteria, which is a very complicated task for a planner to do manually. The use of Geographic Information System (GIS) is recognized as one of the most promising approaches to analyze complex spatial phenomena. GIS has been successfully employed for a wide range of applications, such as geology, protection and management of natural resources, risk management, urban planning, transportation, and various modeling aspects of the environment.

The main objective of this study is:-

1- Preparation of data base for the crop residuals in study location special rice straw by Satellite image and GIS.
2- Maximize the utilization of agriculture crop residues.

MATERIALS AND METHODS

GIS is a powerful tool which used for computerized mapping and spatial analysis. It provides functionality to capture, store, query, analyze, display and output geographic information. It is used in many applications such as geology, protection, natural resource management, risk management, urban planning, transportation, and various aspects of modeling in the environment. It one of the programs is used for decision making.

1-Select crop residues for study

In Egypt, Burning of rice straw is causing a lot of environmentally problems where massive amounts of post-harvest rice residues are burned to save time for preparing the land for the next crops.

In Egypt, Dakahleia was selected as one of the Famous governorates for cultivating rice crop, the area of rice is 350661 Feddan and Sinbilawin center is the biggest center in Dakahleia for planting rice, the area of rice is 47163 feddan.

2-Software programs were used in the present study.

A- Google Earth program

Google Earth combines the power of Google Search with satellite imagery, maps, Terrain and 3D buildings to put the world's geographic information at your fingertips. It displays satellite images of varying resolution of the Earth's surface, allowing users to see things like cities and houses looking perpendicularly down or at an oblique angle, with perspective.

B- ENVI program

It has been used to separate layers from the satellite image as layer of road, layer of urban, layer of canal and layer of sites to the rice crop planting…. ENVI Classic is the ideal software for the visualization, analysis and presentation of all types of digital imagery. ENVI Classic's complete image-processing package includes advanced, yet easy-to-use, spectral tools, geometric correction, terrain analysis, radar analysis, raster and vector GIS capabilities, extensive support for images from a wide variety of sources, and much more.

C- Geographic information system (GIS)

A GIS is a powerful tool which use for computerized mapping and spatial analysis. A GIS provides functionality to capture, store, query, analyze, display and output geographic information. Arc GIS Desktop 10.1will be using in the present study's It is the newest version of a popular GIS software which produced by ESRI. Arc GIS Desktop is comprised of a set of integrated applications,

D-Area and sites of rice straw in Sinbilawin

Arc GIS10.1 was selected in this study to determine the area and sites of rice straw amounts in Sinbilawin center. To achieve the former goal must be become the satellite images (land sat 8) for the province of Dakahleia and the Sinbilawin center. The images called operation land imager (OLI). Thus, three layers according to satellite image were, the administrative limits of Dakahleia governorate and Sinbilawin center, layer of rice crop area and sites in Dakahleia governorate as the main layer and layer of rice area and their sites in Sinbilawin center.

3-The methods take the following steps:-

To a chive the former goals of this study must be received the satellite images (land sat 8) for the province of Dakahleia and the Sinbilawin center. The images called operation land images (OLI). Thus, layers will received from the satellite images such as water channels, drainages, urban areas, main and sub- roads, rice crop areas and sides. (ENVI) program has been used to separate layers and place it in a file which named (Shp file) for easy insertion in ArcGIS10.1 program**.**

- Location and The administrative limits of Dakahleia governorate and Sinbilawin center. They were uploaded as map for each by Google Earth program and satellite image.
- The data of area and sites to rice crop in Dakahleia governorate were collected from the Ministry of Agricultural - Central Administration of Economy and Statistics as numerical data for each center in Dakahleia governorate. Map for Dakahleia governorate was obtained via satellite image from the Remote sensing Authority.
- Area and sites of rice crop in Sinbilawin center as numerical data for each 99 village and as map were obtained and collected as layer via satellite image from the Remote Sensing Authority. It was used with GIS ARC10 program to inference the sites and area of rice crop in the Sinbilawin center villages**.**

RESULTS AND DISCUSSION

1-Location and The administrative limits of Dakahlia and Sinbilawin

The administrative limits of Dakahlia governorate is bounded by El-Shrqia governorate east, El-Gharbia governorate west, The Mediterranean Sea north and El-Qaliopia governorate south as shown in Fig. (1). It is lies between 31°29'28.75"E longitude and 31° 4'59.53"N latitude. Sinbilawin is bounded from the east side by the Timai El-Amded city and from the west side by the Aga city, north side by the Mansoura city and to the south by the Diarb Negm city. The Sinbilawin lies between 31°27'38.07"E longitude and 30°53'1.55"N latitude according to (Google Earth) as shown Fig. (2)

Fig. 1. The administrative limits of Dakahlia governorate

Fig. 2. The location and administrative limits of Sinbilawein center

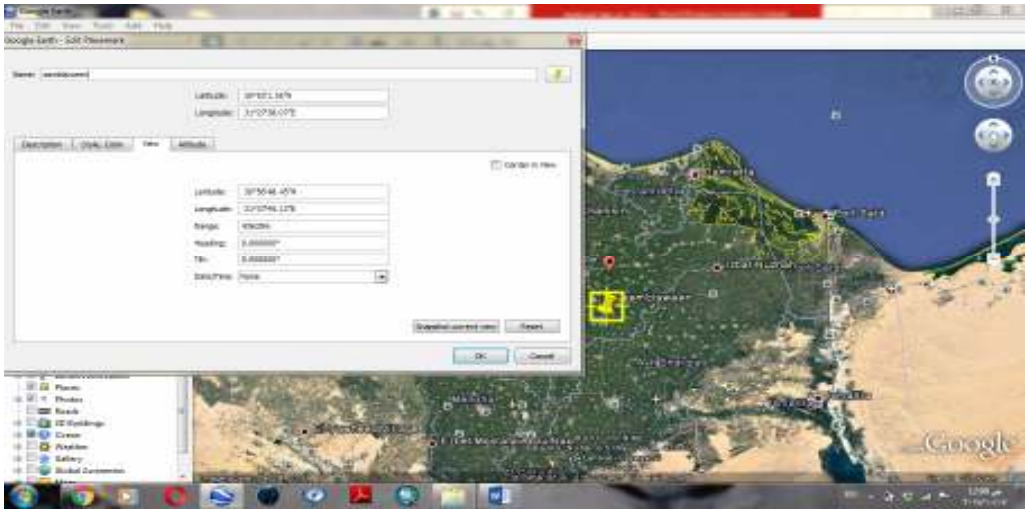

Fig. 3. Google Earth image for Dakahleia

2- The rice crop area, sites, urban, roads and canals in Dakahleia

The area and sites of rice crop in Dakahleia governorate as numerical data for each center in Dakahleia governorate was obtained as shown in table (1) and represented by diagram as shown in Fig. (3). The total area of rice crop was 350,661 feddan. The average of rice production was 4.469 ton/fed., the average of rice straw was 2.5 ton/fed and the total production of rice was 154, 6938 ton. Also, Dakahlia governorate was represented as the main layer that included canal, roads, urban and rice sites in Dakahlia governorate as shown in Fig. (4).

3- Layer of The rice area and sites in Sinbilawin center

The area and sites of rice crop was obtained and collected for Sinbilawin center as numerical data for each village as shown in table (2). The total rice crop area was 340,78.02 fed., the total of rice straw production was 59,350.457 ton. Also, Sinbilawin center was represented as the layer which included canal, roads, urban and rice sites as shown in Fig. (5).

4- Layer of the road network in Sinbilawin center

The network; of rods is very important factor' it is effecting for collecting rice straw The layer of roads network was resulted from using satellite image of Sinbilawin center in ArcGIS10-1program as shown in Fig. (6).

Table 1. The area and sites of rice crop in Dakahlia

Sites (Center)	Area of old land (feddan)	New land area (feddan)	Average rice productivity per feddan (ton)	Rice production (ton)
Aga	10911		4.393	47933
Blkas	35041	18300	4.554	159571
Dekarnes	17296		4.494	77720
Met Swed	32410		4.797	155459
El-senblaween	47163		4.472	210903
Tmay Elamaded	23298		4.187	97553
Sherben	21695		4.48	97204
Talkha	32191		4.212	135585
Elmanzala	3474	16243	4.275	149154
El- mansora	44746		4.34	194206
Met ghamr	22357		4.51	100833
Menet El-Nasr	25536		4.731	120817
Total of Gov.	350661		4.469	1546938

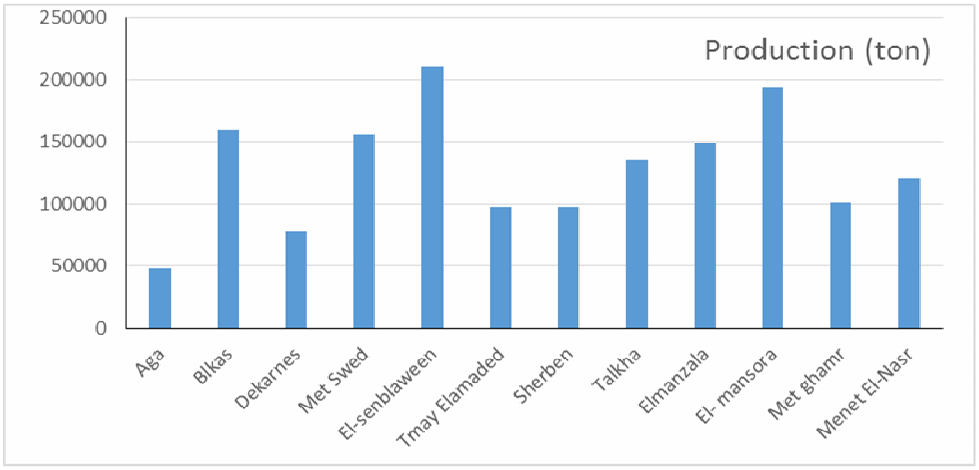

Fig. 4. Diagram of rice production for Dakahleia governorate

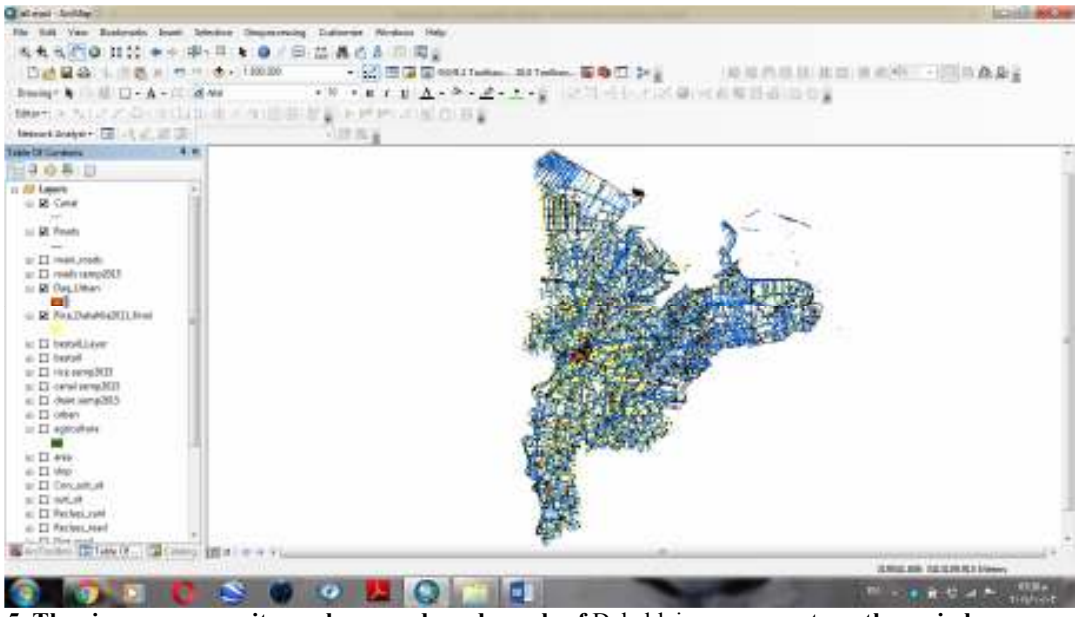

Fig. 5. The rice crop area, sites, urban, roads and canals of Dakahleia **governorate as the main layer**

Table 2. rice straw production in Sinbilawin center

Name and no. of village	cultivated area of rice (fed)	Rice straw production (ton)	Name and no. of village	cultivated rice Area(fed)	Rice straw production (ton)	Name and no. of village	cultivated rice Area (fed)	Rice straw production (ton)
1	91.03	158.540	35	47.35	82.457	Tarabes elarab	1296.10	2257.284
E-lsarse	406.04	707.157	36	49.78	86.705	Manshat ezat	226.00	393.597
3	143.73	250.322	Kafr elhag azab	377.54	657.526	Kafr azam	205.95	358.685
4	13.25	23.077	El-shoala	420.14	731.713	71	73.87	128.647
5	349.24	608.237	39	85.17	148.325	El-azawe	275.97	480.623
6	46.93	81.729	Daio-elwasta	1068.64	1861.136	El-ramzia	176.55	307.475
El-orman	264.76	461.113	41	201.87	351.581	74	409.36	712.934
Kafr shopra hor	140.67	244.998	42	104.52	182.032	El- galila	745.60	1298.531
Met ghorab	159.52	277.827	43	264.46	460.586	Shopra sende	376.43	655.596
10	23.55	41.010	44	56.28	98.019	El- hasena	972.29	1693.332
11	265.37	462.165	Barken	706.07	1229.693	78	12.94	22.541
12	26.77	46.619	46	83.79	145.937	79	30.17	52.538
El-makhzan	656.60	1143.534	Tamai el zahira	817.66	1424.033	brhamatosh	776.40	1352.170
El-matoh	207.00	360.505	Balamon	536.12	933.698	Kafr elanina	84.17	146.592
El-roda	498.36	867.940	Kafr bane salam	98.57	171.672	82	60.60	105.548
Tokh-elaklam	1036.20	1804.639	El-senblawain	1925.19	3352.914	mobark	23.56	41.040
Noptaref	537.14	935.480	Manshat reda	344.74	600.396	Met ghreta	1358.54	2366.035
El-salam	444.92	774.867	El-hagaiza	303.69	528.902	85	234.24	407.948
Kafr-elrok	449.03	782.036	Abo karamet	809.65	1410.082	86	65.01	113.223
Manshat helal	443.61	772.584	Kafr ganam	655.59	1141.775	Kafr Mohamed elshenawe	285.16	496.638
Borg nor elarab	423.53	737.624	Kafr saad	309.64	539.265	88	1.47	2.566
23	130.34	226.992	Ghazala	1013.09	1764.392	shoprahor	474.56	826.495
24	6.34	11.047	El-hasawa	296.80	516.906	Tanbor elkobra	1236.10	2152.792
Tanbara	406.54	708.036	Kafr konsowa	267.33	465.574	Kafr abd alla elamen hasab alla	464.30	808.627
Kafr tanbol elkadem	430.25	749.327	Bashmas	438.90	764.393	Shopra kobala	624.48	1087.599
27	33.84	58.937	Tahawai	646.96	1126.745	Kafa Yousef awad	404.90	705.169
El-zahaera	622.34	1083.859	Kafr elshahed mostafa hamoda	84.07	146.411	El-bakarea	200.55	349.270
Eltamd elhagar	240.53	418.912	62	9.40	16.364	El-wehda elarabia	257.57	448.586
30	7.57	13.181	El- zorake	328.39	571.922	elfath	201.02	350.089
31	50.88	88.613	64	20.10	35.003	Kafr bane gerges	357.46	622.546
32	72.86	126.885	65	1.98	3.446	elkanan	130.30	226.931
33	10.85	18.894	El-mkataa	699.74	1218.669			
34	3.04	5.286	Kafr elshorafa	320.72	558.566			

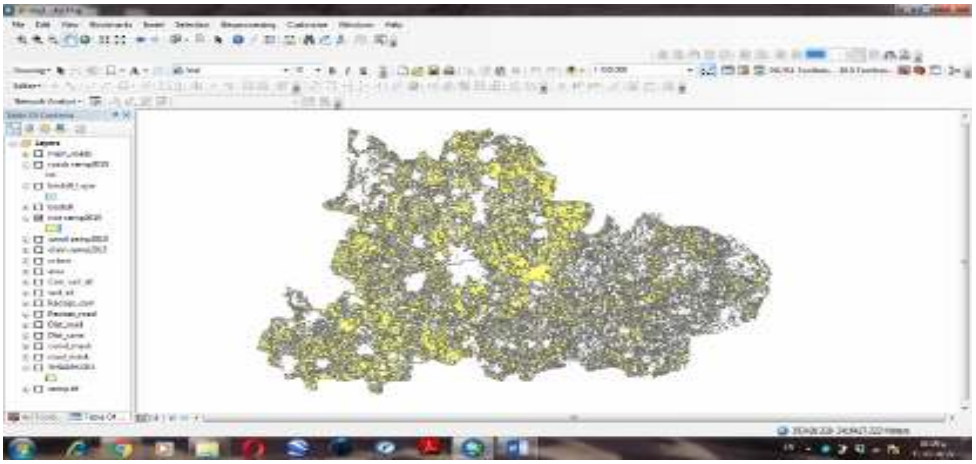

Fig. 6. The rice area, sites, urban, roads and canals in Sinbilawin center.

CONCLUSION

1- Geographic information technology systems (GIS), specialized software programs and satellite image are using to obtain a complete database of any site on the spatial map of the world .

2- In the present study Dakahlia governorate and Sinbilawin were selected as the largest for planting rice and choose Sinbilawin as the largest center for planting rice. Also, the administrative boundaries, sites and area of rice crop of each Dakahlia governorates and Sinbilawin center were determined.

3- All previous steps in the present study gives opportunity to the specialists to predict for actual productivity from rice crop and rice straw in all governorates that contributes to preparation feasibility studies and strategy plans which help decision-makers to take the right decision to deal with the production and problems such as rice straw residues

4- All steps in this study are considered as the one of the most important steps that must be taken before the work of any study to deal with the residues as rice straw in terms for choosing the most suitable sites to collect and recycle it.

REFERENCES

Amjad Kallel, Mohamed Moncef Serbaji and Moncef Zairi, (2016) Using GIS-Based Tools for the Optimization of Solid Waste Collection and Transport: Case Study of Sfax City, Tunisia, Hindawi Publishing Corporation, Journal of Engineering, Volume 2016, Article ID 4596849, 7 pages, http:// dx.doi. org/ 10.1155/ 2016/ 4596849

Mazaher, M. (2010). Sitting MSW landfill using weighted linear combination and analytical hierarchy process (AHP) methodology in GIS environment (case study: Karaj). Waste Management, 30: 912-920.

Mohamed Elfeki, Emil Tkadlec (2015) Treatment of municipal organic solid waste in Egypt, J. Mater. Environ. Sci. 6 (3) (2015) 756-764, ISSN: 2028-2508 CODEN: JMESCN

Moustafa, A.A. Abdelhalim, A.B. Eltawil, and N. Fors , (2013) Waste Collection Vehicle Routing Problem: Case Study in Alexandria, Egypt , E. Qi et al. (eds.), The 19th International Conference on Industrial Engineering and Engineering Management, DOI 10.1007/978-3-642-37270-4 89, © Springer-Verlag Berlin Heidelberg 2013.

Sule, J. O., Aliyu, Y. A. and Umar, M. S., (2014) Application of GIS in Solid Waste Management in Chanchaga Local Government Area of Niger State, Nigeria, IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) e-ISSN: 2319-2402,p-ISSN: 2319-2399.Volume 8, Issue 9 Ver. II (Sep. 2014), PP 17-21 www.io srjournals.org.

إستخدام نظم المعلومات الجغرافيه (GIS) وصور الأقمار الصناعية فى تحديد مواقع ومساحات قش الأرز

رشا سيد أحمد ، سمير أحمد على ، مجدى أحمد بيومى و السيد جمعه خاطر

قسم هندسة النظم الزراعية والحيويه – كلية الزراعة - مشتهر – جامعة بنها

معهد بحوث الهندسة الزراعية – مركز البحوث الزراعية – الدقى – الجيزة – مصر

في هذه الدراسة، تم اختيار قش الأرز كمخلف محاصيل رئيسي ويسبب مشاكل بيئية في مصر .وستساهم نظم المعلومات الجغرافية وصور القمر الصناعي بوصفها التكنولوجيا الجديدة في حل هذه المشكلة ..وتم اختيار محافظة الدقهلية كواحدة من المحافظات الشهيرة بزراعة محصول الأرز حيث تبلغ مساحة الأرز بها حوالي ٣٥٠٦٦١ فادن . ويعتبر مركز السنبلاوين من أكبر المراكز في محافظة الدقهلية لزراعة الارز الذي يمثل حوالي ١٣.٥٪ من إنتاج محافظة الدقهلية . وتم استخراج واستنتاج الحدود الإدارية لمحافظة الدقهلية من Google Earth تقع في شرق محافظة الشرقية ، ومن الغرب محافظة الغربية ، ويحدها من الشمال البحر الأبيض المتوسط ومن الجنوب محافظة القليوبية جنوب . وهي تقع بين خط الطول 31° 29' 28.75" E، وخط العرض 31° 4' 59.53" N .مدينة سنبلاوين حدودها من الشرق مدينة تيماي الأمد، ومن الغرب مدينة أغا، ومن الشمال مدينة المنصورة، ومن الجنوب مدينة دیارب نجم وهي تقع بين خط طول ٣١ ° ٢٧ '٣٨.٠٧ " وخط عرض٣٠ ° ٥٣ '١.٥٥ " N "وقد تم استخدام برنامج ENVI لفصل الطبقات مثل الطرق، والحضر، والقنوات المائيه، ووضعه في ملف الذي يدعى (ملف Shp. file). وكانت النتائج من صورة الأقمار الصناعية، ENVI وبرامج ArcGIS وتم استنتاج خرائط لقري مركز سينبلاوين التي وصلت الي ٩٧ قرية، وتم حساب مساحة الأرز التي بلغت ٣٤٠٧٨.١٢ فدان وكان مجموع قش الأرز ٥٩٣٥٠.٤٥٧ طن. أيضا من استخدام ArcGIS10-1 تم تحديد الطبقات المختلفة لمركز السنبلاوين مثل الطرق، القنوات المائيه، الصرف، الحضر، طبقة من مواقع قش الارز، وطبقة للمساحات المزروعه.