Chapter One

1.1Background:-

River Nile state regard is regarded as agricultural state in the Sudan ,the economy in this state depend on the crops like wheat ,seeds , Egyptian peens ,and other crops.

Beside the agriculture it depends by scare of the industry, and suffer from lake of energy and animal resources.

According due to available water from river Nile and atbra Nile, the government of the state had orient all economical activities attention, and employment to agriculture ,and the suitable soil is helping this orientation.

To improve the agricultural management many problems must be solved like the problems of the boundaries between the owners and registration problems ,on generally improve the cadastre to management the agricultural lands properly starting from the field works ending by the mapping product.

In this research we present planning to solving upper problems.

In the Sudan the importance authority of the surveying and mapping is the department of surveying and importance authority of registration is the judiciary headquarters.

1.2 The objectives:-

* To bring all map (WGS 184) .
* To enable accurate demarcation of the land boundaries in the case of removable of displacement of the control points.
* To build a complete data base for the agricultural land combating the spatial data and attributes by applying GIS.

Digital system provide simple procedures and frequent access of the data through one window to satisfy users demands in a secured way.

Thesis layout:

This research includes seven chapters; chapter one contains background includes the definition of the problem of research, objectives and its importance of study.

Theoretical framework consists of three chapters (chapter two chapter three and\chapter four).

Chapter two contains cadaster and cadastral survey chapter three contains.

The ownership in the land of Sudan and chapter four contains global posting system.

In chapter five the steps of Georefericing Cadasteral Maps by Geodetic Coordinates .

Chapter six deals with data, the data analyzed discussion and results.

Chapter Seven contains conclusions and recommendations.

Chapter Two

Cadastre and cadastral survey

2.1 Cadstre and cadastral survey:

2.1.1 The nature of cadastere:

Acadastre is defined as general, systematic and up to date register containing information about land parcels including details of their area, value and ownership.

Cadastres and cadastral survey are concerned with land, law and people.

Acadastre in general, systematic and up to date register containing information about land parcels including details of this area, value and owner ship.

Aland parcel is an area of land which may be identified as a unit for recording information and may for example be afield under uniform cultivation or a unit of owner ship such as residential lot or plot of land.

The deviation of the word cadastre is uncertain is thought to come from the Greekkatastikhom, (meaning a note book or business record).

Cadaster may be classified as fiscal, legal or multi purpose.historically, the physicalcadastre were compiled for the purpose of raising revenue through land taxation but many of them have become legal cadastre in that they also include records of proprietary interests in land. increasingly, those responsible for the administration of land find it necessary to record more extensive information about the land parcels such as the nature of the soil,the vegetation recover , the land use and the capability, any improvement such as building ,the slope and aspect of the land,drainage and details of the water, gas and electricity services.

Such record maybe refer to as multipurpose or utility cadastres and are concerned with the provision of reliable information for planning the better use and administration of land.

Although it does not follow that reliable information gives rise to efficient administration and the making of correct discussion in matter of planning, it is often true that bad discussion and bad administration arise through alake of food information.

Cadasters as arule have two parts,the first of which is the written record or register containing information about each parcel such as the name of the owner and areference to the location of the parcel and it is nominal area and value, the second part of the cadastre is cross-referenced to the first and contains adetails description of the parcel either in the form of maps or survey data.

Generallyspeaking, the register answer the questions concerning owner ship of land and conditions under which is held (that question is whose and who).

The cadastral survey is concerned with the location of the land and it is extent (where and who much), aland complete because not all parcels have been registered.The term land registration is misleading in that in common wealth.

2.1.2 Cadastral surrey:

Cadastres and cadastral surveys are an aspect of land administration. The primary object of cadastral survey is to determine for each land parcel it is location , the extent of it is boundaries and surface area and to indicate it is separate identity both graphically on amapor record and physically on purpose cadastre to satisfy the overall information requirements of land administration.

Although cadastral survey may extent to the collection, processing and presentation of awideverity of land information, they are often restricted solely to the recording of the location property boundaries.

The growth of land surveying profession in the common wealth has been greatly influenced by the growth and education of the land surveyor.

The influence of the military on mapping has been profound and has led to the development of mange techniques of surveying which have been of inestimable benefit. The consequences for land surveyorshave,however,not been so satisfactory. The basic education of the land surveyor to day still provides an approach to mapping which stems from tactical rather than land requirement, as result cadastral surveying is often seen either as an adjunct to topographic mapping or as asimple application of measurement since with the more complex and inteuectuallychilling aspect of land surveying lying in geodesy or photogrammetric.

The cadastral surveyor must be professional man to achive, identifies, determines the boundaries of measurement and values public or private landed pottery, whether urban or rural , and whether on the surface or below, as well as works executed thereon , and who arranges for the registration of the property and settles questions of responsible connected there with. And who also study , plans with new technical, legal , economic , agricultural and social aspects of the aforementioned.

The key to real understanding of the cadastral surveyor role lies not in theories of measurement but in the fundamental promotion that the determination of the limits of any region in respect of which some person or body hold exclusive legal tights is, in the final analysis, not matter of law.

This is so because the concept of limit in that context implies the existence of a different proprietorship beyond that limit and where there are opposed interests separated by common line.

The cadastral surveyor is vitally concerned with the problems of boundary survey of who ever perfectly the deed or other document of title to parcel of land may be drafted in legal form , the document is of little use if the land to which it refers cannot be identified and it is boundaries located.

Boundary surveying is, however , not necessarily a professional activity for the problems that arise can be solved at sub professional level if the system is well documented and is based on sound survey principle.

Complex problems concerning the retracement of old boundaries airsprimarily on those areas where registration of title has been integrated into a national frame work.

2.1.3 The cadastral problems:

Cadastral surveying is an expensive process not only in it is execution but also in the loss of capital from delays in development and investment which may arise through it is inefficient operation.in most countries there are areasof land where the costs of survey approach or even exceed the capital value of the land whilst in less affluent countries, even under favorableconditions,the costs of survey normally amount to asignificant percentage of the land value .

The problems besting more developed countries are no less server.From Ontario, Hadfield wrote:

The best figure that I have available to me indicate that the expenditure of the survey industry in Ontario in the area of legal surveys is approximately 20million (dollars) per year. We have enormous problem and are presently

spending very significant funds in the survey field to study level and keep just equal to the problems that we face.

It is obvious to us in Ontario that the professional response which we presently are able to bring to bear on the needs of society is one which is doing little or nothing to create along term solution.

One develops the horrible feeling that the whole system is gradually collapsing in upon it is self and that the costs of locating boundaries and performing surveys will predictably climb until they are beyond reason.

To me it is the realization that our heritage from the past is one enormous problem, that the future can only enlarge this problem,and that we as suction,

That consider collectively being the most important issues that we face in land registration and legal surveys. There are not enough days in our collective survey lifetimes, not enough money in the government or public definition and location over the next 25 year, if we continue to use existing methods and techniques. This is the problem.

The problems faced the cadaster in Sudanspecially in river Nile state in the agricultural lands there is alack of survey control and whereas many of the boundaries of properties have been carefully traversed, there are not coordinates of large variety landed, and there are old map since of British government in the Sudan, this maps needs to renew because much of them are destroyedas result of bad uses and bad store.

In this state we need to resurvey with new coordinates, and new maps, since that the surveyors have ability to determine the ownerships.

After that we can make the ordnance survey planes , and permanently adapt to the economic and social needs but we still attempt to improvement auricular survey to faced social and economic needs.

2.1.4 Investigation of cadastral problems:

At first sight, seem desirable to carry out form of cost-benefit analysis of cadastral system. Cost –benefit analysis is technique which has been successfully applied to the evaluation of different means to the same end, it has also been use to evaluate the desirability or consequences of new projecects. In the latter case it has proved to be suspect in both theory and practice and can not yet be regarded as proven technique.

In general it is easier to assess costs than it is to predict and evaluate benefits or to determine which benefits have arisen directly from the course of action that has been followed rather than from specific or extraneous factors.

In estimation costs, controversy arises in determining the extent to which certain overheads such as pension payments to retired surveyor can and should be included, or whether costs should be based either on scale of fees prescribed by professional institution or on the accrualcosts incurred, which may be significantly different. In assessing systemoverall, it is arguable thatcosts, not charges, should be considered although there is then the problem of how to proportion cost and benefits between different users of the same system, for example in an integrated survey system where many uses may be found for survey information and where all surveys must be connected to a controlnetwork, what percentage of the cost and benefit of that control should be offset against the cadastre.

The methodology for carrying out cost-benefit analysison surveying and mapping activities has not yet been satisfactorily established even though it may be yet prove to be feasible. It is at present not normally possible to estimate the costs of future mapping since costs change, technology changes , labor rates and the value of money alter,unless comparison can be made at agiven point in time, it may become highly suspect, if not meaningless. Survey is an investment

as much for the future as for the present and to date there is no satisfactory methodology whereby the future benefits of survey can be estimated in quantifiable from to compare with the costs of the present.

Some degree of value judgment must always creep in to any analysis but this should not give rise to concern as long as it is based on common sense.

In the final analysis, social and political priorities must rule and these are certainly indeterminate by any economic method.

Cost-benefit analysis may be valid when used to assess different methods of achieving the same end.

Thus for example when considering the costs involved in searching for land title information in certain record systems, the total man-hours spent on searching titles may be established and through known laborratesand estimate of costs may be obtained. The cost of establishing and operating an alternative system may be evaluated and comparison made between the two methods of doing the same thing. On the other hand, surveys may be performed with or without control.

Although maps and surveys do not conform to condition which characterize information theory which has been built around specific communication net work, asystem analysis approach may be adopted to determine whether the methods adopted for each stage of asurvey operation maximize efficiency both for that stage and with in the system overall.

It will not, however, indicate whether the survey itself is worth while or what benefits may accrue from its successful completion.

There are many difficulties which arise in attempting to assess the basic expenditure on cadastral surveys, since few organizations maintain detailed costs of their operations or are able to provide evidence as to which stages in

asurvey are more expensive than others. Sample estimates of the proportion of time or cost involved in each stages in survey are often unreliable and there would appear to be no such thing as anormal survey.

The argument above might appear to suggest that any economic analysis is too unreliable for any such investigation to be worthwhile. This would, however ,be wrong. Reasonably reliable and justifiable figures can often be derived and the above remarks should be seen as acaution against placing absolute faith in their accuracy rather than as an attempt to evade the issue.

The economics of surveying and mapping are coming under closer scrutiny in many parts of the world and if the land surveyor is to sustain his service then he must pay closer attention to the principles and practice of economics and be prepared to argue the case in defiance of the expenditure he incurs on behalf of the public even though asatisfactory methodology of survey economics has not yet been established.

Surveyors have often attempted to justify the high costs of cadastral survey on the grounds that precision surveys are necessary in order to prevent boundary disputes.

Could such disputes be avoided by carrying out surveys to lower degree of precision and hence at lower cost. Where is the cut off point at which the investment in cadastral surveys ceases to produce any further benefits to justify?

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Where is the cut-off point at which the investment in cadastral surveys ceases to produce any further benefits to justify higher expenditure ,at what point would the cost of settling dispute in court exceed the costs of low grade cadastral survey system.

Chapter Three
Ownership in the Land of Sudan

3.1Historical background:

Since the black sultanate(1504-1820) up to the turco-egyption rule (1821-1881) and Mahdistrule(1881-1898), and land were used for cultivation, woodcutting, grazing, hunting, and residential purposes. the sultan was owner of the land and who could make grants to:

1-absolute individual owner ship.

2-over lord or private landlordism

3-tribal or communal ownership.

3.1.1Absolute individual ownership:-

Absolute individual owner ship was known on the river lands, which can be irrigated by floods or mechanical means, and cultivatable rainlands. River lands individual owner ship is exercised widely up to now in river Nile state.

Land on the bank of the river adjacent to the water which is covered by water in the river floods season is called Gerfor Seluka,the land neighboring the Gerfis called Sagiawhich is irrigated by river floods water or by mechanical means from the river water or wall called Matara.

3.1.2Private landlordism:-

This type of ownership was exercised over extensive tracts of cultivable rain lands. The owners of this type were fung ruling class or tribal heads or religious sheikhs.

They had been offered large areas of land as grants for the sake of collecting tributes overt.

3.1.3communal ownership:-

Larger tracts of cultivable rain lands occupied by tribes were owned by these tribes.

The head of the treble was considered as overlord by whom the use of land was regulated for the benefit of the who treble. The power of the landlord were govern by custom subject to the ability of this people.in some areas in the Sudan the Tribal move to unoccupied areas suitable for grazing were water to available, they reoccupy their homeland again when they return. This type of ownership had been modified to village ownership however it serviced for along time among the Nilotic tribes in the southern Sudan.

3.1.3.1Village ownership:

The communal ownership had been modified to the village ownership. The sheikh of the village had taken the place of the overlord with limited powers.

The village lands were cultivated by the village genral right with out determination for each of them to cultivate particular piece of land.

3.1.4Ownership documentation:-

The turco-egyptian rule and Mahdiststate don't develop any system of ownership documentation,they focused on the way by which they could collect tributes and taxes on date trees, other fruits , animals ,crops and other property.

There was some form of documentation proving grants,gift , inheritance , wakf, wills, sales and pre-emption kept by the land occupants.

3.2Land ownership and limitation on it:-

Land is defined in the land settlement and registration ordinance 1925,as the most important and of general application among anumber of definitions, as(land includes benefits to arise out of land and buildings and things presently fixed to land, also and undivided share in land and also any insert in land which requires or is capable of registration under the ordinance other than a change but including the right to cultivate adeterminate or determinable area of land although its situation may vary from year to year).

Due to this definition many rights are added beside the right of ownership , such as right of cultivation , pasture, the right of occupation and cultivation known as the right of amara and any other beneficial right.

3.3Type of land ownership in the Sudan:-

The old known of ownership of land in the Sudan was the communal or tribal ownership where lands were shared by the community. According to the natural progress of the society, family ownership had compensated gradually the communal or tribal ownership as similar units. Families within one village owned land near or at short distance of their village as harm of the village. The use of land owned by the village or the family was controlled by sheik of the village or the chief of the family, with limited powers.

Due to the extension of town and village and settlement of people according to the pressure of increasing population , together with existence of new dealing on land such as sale , mortgage, and lease. The individual ownership started analogous to these new circumance. Individual ownership was governed by statutory , common law, contractual and customary limitation.

The use and enjoyment of land was subject of some restrictions regarding the benefits of the community. Later during the recon quest of the Sudan (1898) appeared a new type of ownership known as government ownership . The government under the land settlement and registration ordinance, 1925 declared

all waste, forest, and unoccupied land as property of the government until the contrary is approved. As a conclusion of land tenure in the Sudan, three main types of ownership can be counted as follow:-

(1)Communal ownership in the southern, the western and the eaten regions of the Sudan. The land is owned in these areas by the tribes, families and the villages under the rights of cultivation, grazing, hunting, etc….

(2)Individualredistricted ownership in the Nile, northing , Khartoum, Gezeera, blue Nile white Nile and Kassalaprovinces. This lands are river lands,urban centers , and mechanized artificially irrigated or rain irrigated.

(3)Government ownership based on settlement and registration , land acquisition and the unregistered land act, 1970.

If the registered privately owned land is needed by the government for apublic purpose, affair compensation should be paid to the owner , under land Acquisition ordinance 1930.

3.3.1 Co- ownership of unindividual shares:-

When two or more persons are jointly owners of land or movable property ,and their shares are undivided they are know as co-owners . the share of each owner can not be determined on the ground. Two conditions should be satisfied to divide ashare of any co- owner: the consent of the other co-owners and this share should satisfy the minimum register able area prescribed in the land settlement and registration ordinance, and the council of ministers or ministeracting under resolution of the council of ministers prescribe the registration minimafor plot to be registered separately and for divided shares in plots.

3.3.1.1ownership of storey buildings:-

In the case where persons are sharing amulti- storey building as co-owners, there is no stature, juridical precedent nor practice governing this situation in the Sudan with reference to justice and practice elsewhere this persons are considered as co-owners of the ground and parts of building intended for the common use of all , especially for the foundations, the main walls , the main entrance , yards, roofs, lifts, passes corridors, the floor support,and pieces of all kinds except that inside the storey or the apartments .These common buildingscan not be divided and the share of each owner in them is corresponding to these share in the building . the rule governing the enjoyment of the common parts , cost of maintenance, management and reconstruction had been borrowed with modification from the Egyptian civil code 1948.

3.4 Limitation on the ownership of land:-

Ownership of land is controlled by legislation, custom and Islamic law. The absolute right of the owner of land are qualified and limited , he is restricted from causing injury to another party, also others may have right on his land , such as the right of way , tenants, lessee, and mortgagees.

3.4.1 Common law limitation on ownership of land:-

As general rule the enjoyment of the owner on his right on land, must not cause any detriments to his neighborsproperty. the owner is labile against the common law of any troubles caused by his acts or omission to others , such as the storage of dangerous or detrimental ,materials ,follow of water ,bad smell, or collection of flies caused by the use of fertilizers, acts which may caused damage for neighbors buildings ,noise ,etc ….

The owner of the land may be subject to particular covenants or contracts that prevent him from certain use with his neighbors,(any conditions or restrictions

as to building on land or as to the user of the land that may be attached to land may be registered in the prescribe manner and when registered shall bind the proprietor and every person dealing with the land shall be deemed to be affected with notice of such condition or restriction). (S.M.A.elmahdi1979).

3.4.2 Customary restrictions:-

The ownership of the land may be effected by customary limitations such as cultivation, pasture and wood-cutting rights. Rights of Miswag , Amara, Karu, and arid, are restrictions of ownership of land, the cultivators have the right of cultivation. the crop is shared between the owners and cultivator.

HagElmiswagis the right whereby aperson is entitled to enjoy and use the land belonging to another.

Amara right is the right of occupation and cultivation enjoyed by third parties over the land of another person. This right practiced in Khartoum.

The land had to be kept clean and the crop had to be shared equally between the owner and cultivator.Kuru right are customary rights restricted to Shendidistrict of the Nile river state . kuru rights are enjoyed over the land of another person including rights of cultivations, grazing and wood cutting . there are another rights related to third parties such as rights relating to minerals, wild animals, water for irrigation , fishing, drainage and taking of water fot drinking and other purposes by small containers carried by peoples or animals.

3.4.3 Statutory limitations:-

The enjoyment of rights on land by aland owner or occupier may circumscribed by statute. The government has the powers of compulsory acquisition of land that privately or publicly owned by legislation, for public purposes, such as planning , building controls, housing , highways, roads, sea, rivers, and public health. Statutory limitations are imposed in many fields as follows:-

(1) Taxation : land tax, house tax , property tax ,hunt tax and crops tax.

(2) Agriculture and forests: irrigation , forests, cotton , crops diseases , pests, and dates.

(3)Animals and fish: game preservation ,animal quarantine, diseases and fisheries.

(4) Land surveys, settlement and registration, acquisition , disposition, enjoyment, possession, easements, planning, mines, minerals, quarrying ,landlord and tenant, anti equities and building.

(5) Public health.

3.4.4 The Step of registration land:

The land registration meaning the transfer of certain temporarily enjoyed from the government to owners.

Land itself can not of course be transferred, like the goods, from person to another.

In practical the operation of resisted the land are achieved in many steps:-

There are some forms between the survey ,registration,andthe ministry of planning and utilities to complete the land registration procedure.

I. First we must obtain permission to the land that we want to registered from the committee of planning.

II.After we obtain the permission the committee is gives the owner survey form no(10) this form is given to town surveyor ,this form contain the number of plot of certain block , after that make copy to the plot in survey form no(10) , the surveyor give the plot which came from the planning committee certain number and copy of survey number (10).

III. After that the town surveyor fill another survey form called survey form no(40) in this form the surveyor is draw the plot we want to registrated it

The form no 40 retain back from town survey to registration after that the registration manger give the owner search certificate .

Chapter Four

The use of GPS in Georeferencing Cadastral surveying and maps

4.1 Introduction:-

Geodetic coordinates are very essential in cadastral surveying to make a unique definition of each land parcel. The conventional terrestrial survey techniques such as triangulation, and traverse are of avery high cost, time consuming, indivisibility between the stations is needed and the network geometry should be carefully designed. These disadvantages encourages the ignorance of georeferencing of cadastral surveying and maps to compensate the lake of funds and to avoid the pressure of the rapid expanding needs of surveying and mapping new residential , agricultural, industrial and utilities and land extensions. The invention of artificial satellites provides more efficient , flexible and less time consuming technique to establish geodetic network rapidly, accurately, without need of indivisibility between stations and provides high flexibility of geometric network.

4.2 Components of GPS system:-

The GPS system consists of three segments: the space segment, the control segment, and the user segment.

4.2.1The space segment:-

The space segment consist of the constellation of the satellites and the signals broadcasted by them . the basic functions of the satellite are to:

(i) Receive and store data transmitted by the control segment station.

(ii) Maintain accurate time by means of several onboard atomic clock.

(iii) Transmit information and signals to users on two L-land frequencies.

(iv) Provide a stable platform and orbit for L-land transmitters.

The first block II GPS satellites was launched in February , 14 , 1989. From the Kennedy space center, cape Canaveral ABF in Florida , arranged in six circular orbital planes (numbered A ,B, C, D,E, and F).

GPS consist of 24 satellites , 21 active and three as spare (4 satellites in each orbit)., the revolution period of each satellite around the Earth is precisely half sidereal day (11 hours and 58 mints) the present constellation allows for simultaneous observation of at least four GPS satellites from evey point on the Earth at every time of the day .

Eatch GPS satellites transmits a unique navigational signal centered on two L-band , denoted L1and L2 band , The L-band carriers are radio frequency waves modulated to provide satellite information to the receiver such as satellite clock reading , the orbital parameters atmosphere over greate distance s and they cannot penetrate solid objects. The precision code (P-code) was designed for military use only and other authorized users, the P-code are repeated approximately once every 266.4 days.

The coarse/acquisition code (C/A) is repeated every mili second . TheL1 carrier as designed to be modulated with both P-code andC/A code , where as L2 would be modulated only with P-code . the C/A and P-code provide the means by which a GPS receiver can measure one-way ranges to the satellites . The code have the characteristics of random noise , they are binary codes generated by the mathematical a logarithms, referred to as pseudo- random noise (PRN) code. To measure one-way range from satellite to receiver, knowledge of the ranging code(s) is required by the user's receiver. Knowing which PRN code is being transmitted by a satellite means that a receiver can generate a local replica of the same code sequence. These PRN cods possess a very important attribute: a given P-code or C/A code will fully correlate with an exact replica of itself only when the two codes are aligned, and has a low degree of correlation with other alignments. The navigation message contains information on the satellite clock, the satellite orbit, the satellite health status, and various correction data.

4.2.2 The control segment:-

The control segment consist of facilities for satellite health monitoring, telemetry, tracking, command and control ephemerides computation and up link. There are five ground control stations: Hawaii, Colorado springs, Ascension Is., Diego Garcia and Kwajalein. During August and September2005, six more monitor stations of the national Geospatial Intelligence Agency were added to calculate more precise orbits and ephemeresis data . In the near future, five more NGA stations will be seen at least three monitor stations.

4.2.3 The user segment:-

The user segments consist of GPS receivers which are designed for different purposes such as : navigation, surveying, and time transfer. The receiver unit consist of elements for signal reception and signal processing. The signal are received by the antenna from all satellites orbiting above the horizon and transmit them to the radio section after pre-amplification. The antenna may be designed for both L1and L2 only. The electronic center of the antenna should be close to its physical center and of law sensitivity of rotation and inclination to compensate the movement during Kinematic operations.

The antenna should have the capability to filter low elevation of multipath signals. The microprocessor is designed as keyboard and display unit to provide interactive communication with the receiver, and it control the entire system. The function of storage devisees stores the observed data for post processing. The receiver powers power supply may be internal or external rechargeable batteries or other power source . The radio frequency (RF) section from the heart of the receiver. The RF section of single frequency unit process only L1 signals while dual frequency instrument process both L1 andL2 signals. The number of channels is the important feature of RF which determine the number of satellites that can be tracked (separated channel for each satellites). Oscillator

is the basic elements of RF, they generate the reference frequency, they are filters to eliminate undesired frequencies and they mixers.

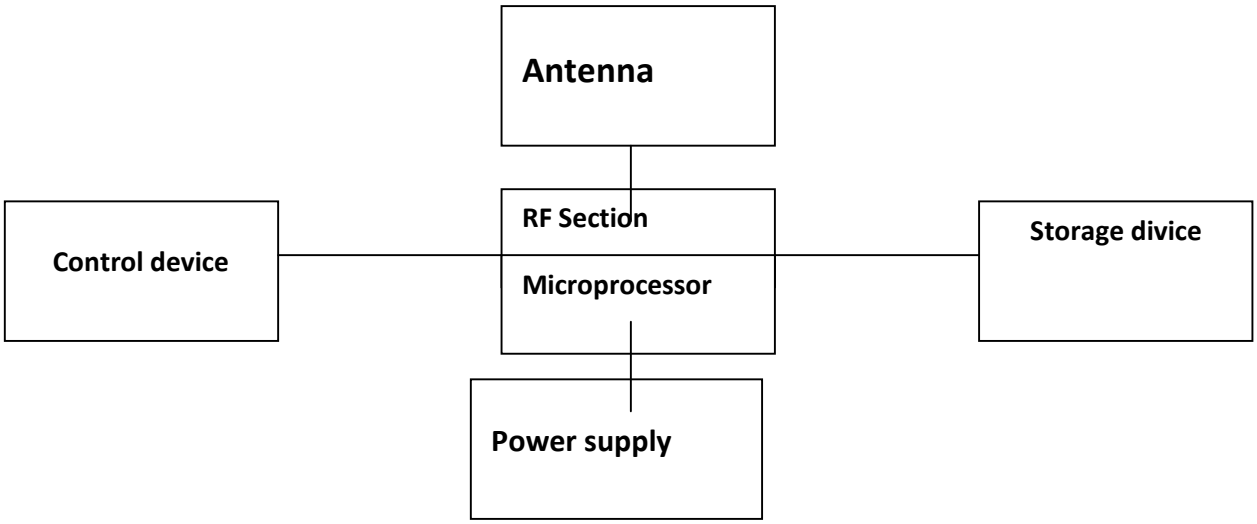


FIG 4.1 Component of GPS receiver

4.2Surveying with GPS:-

The selection of the observation technique in a GPS survey depend on the accuracy level that satisfies requirements of a particular project.

4.3.1 Techniques of GPS observations:-

There are many methods of observations methods using GPS depending on the type and number of receivers, GPS field technique which may be kinematic or static, real-time or post processing , single or dual frequency receiver, and point positioning or relative positioning.

The receiver which has the capability of processing L1andL2 carrier signal is called dual frequency receiver while the receiver that can process only L1 carrier signal is called single frequency receiver may determine the position by pseudo range or carrier phase , the psedurange is calculated by multiplying the time offset by the speed of light, the time offset is the time the signal takes to propagate from the satellite to the receiver , the phase is more accurate than the pseudorange, it is the phase of the received receiver. The technique by which the observation are taken by single GPS receiver is called point, single point or absolute positioning. The differential of relative positioning is the case in which

two receivers are used. One receiver must be set on point of known coordinates to be considered as reference while the other receiver is moving between the points that their positioning are required. The moving receiver is called rover and the stationary receiver is called reference or base. The accuracy of the relative positioning is better than that of point positioning. in receivers equipped by communications systems the correction of the observations taken at the same time can be transferred immediately to the rover receiver from the reference receiver by radio link, this technique is called real time technology, and it is constrained by the coverage of the communication system, this coverage in dependent on the frequency of the radio transmission that is used , the distribution and spacing of transmitters, Alamnelgisaie project located in eldammer village locality of eldammer river Nile state the gogaphic location of the project in figure(1) .

The existing of layout of alamnelgisaie project –eldamer had been examined and it have been found of alaw accuracy to depend on in the proposed system.

We are observe 10 points in the project observed by GPS devices and total station .

In the table below we computing the shift between observed and transformed coordinates:-

Shift= $\sqrt{\Delta E^2 + \Delta N^2}$

Chapter five

The steps of georeferencing of digital cadastral maps by geodetic coordinates

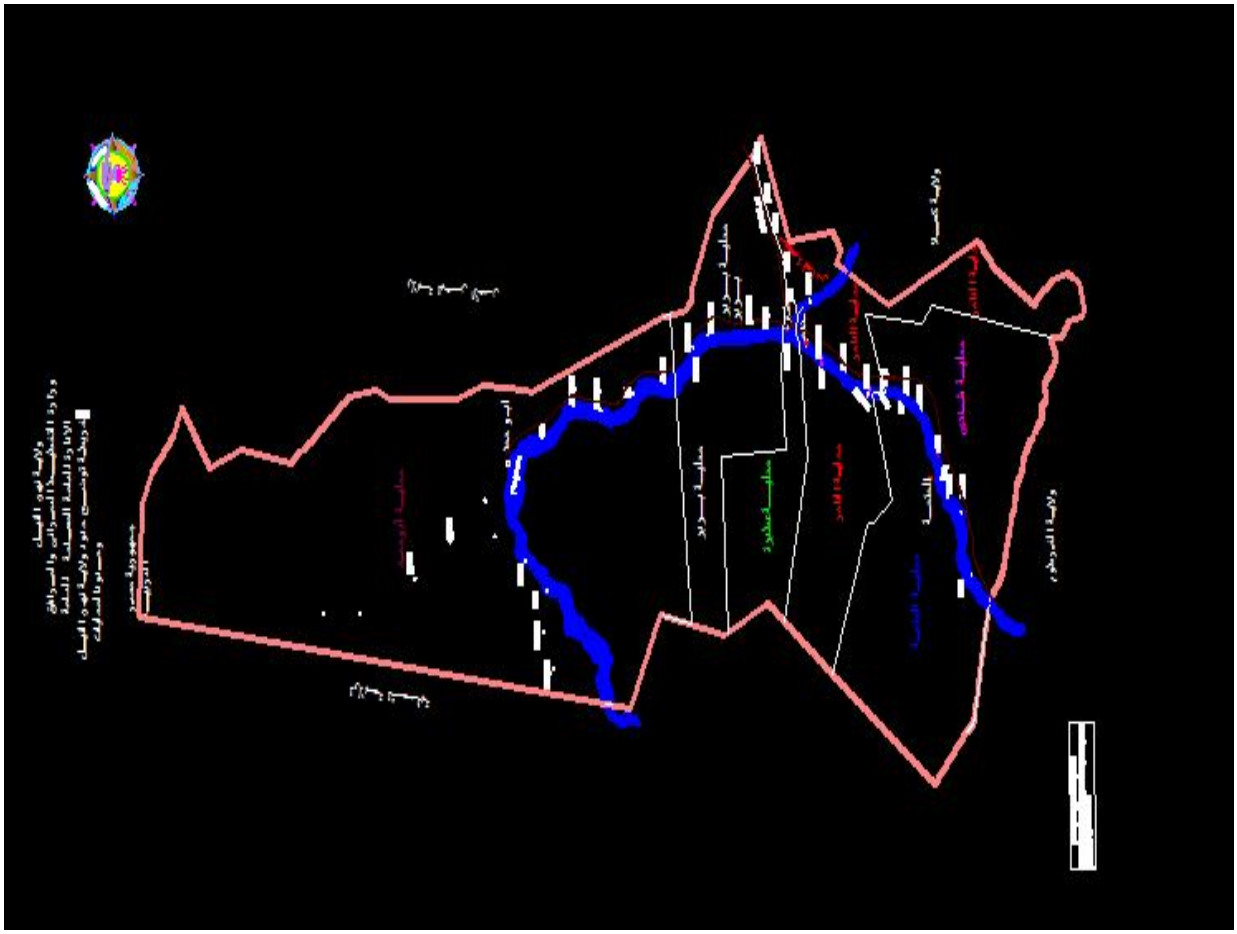
5.1 introduction:

Adigitalintgrated systems had been used in the steps of georeferencing a digital cadastral maps. GPS devices had been used for the acquisition of geodetic coordinates and GIS , Autocad. GPS need only one control reference point to cover a very wide area.

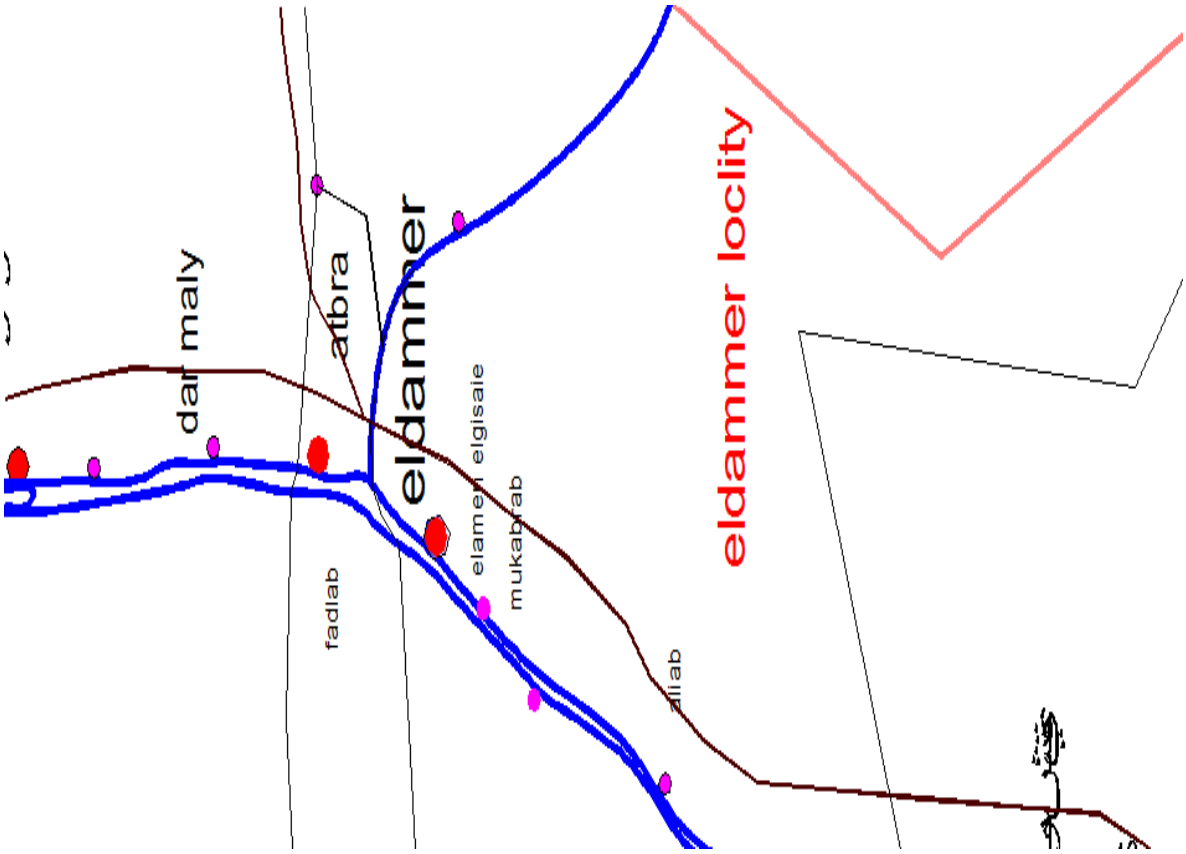
10 points had been observed byGPS and total station. these points are the control points to which the agricultural parcels had been tied for each contron points we had observed independent coordinates by GPS and total atation starting from one referene point.

5.2 Area of study:-

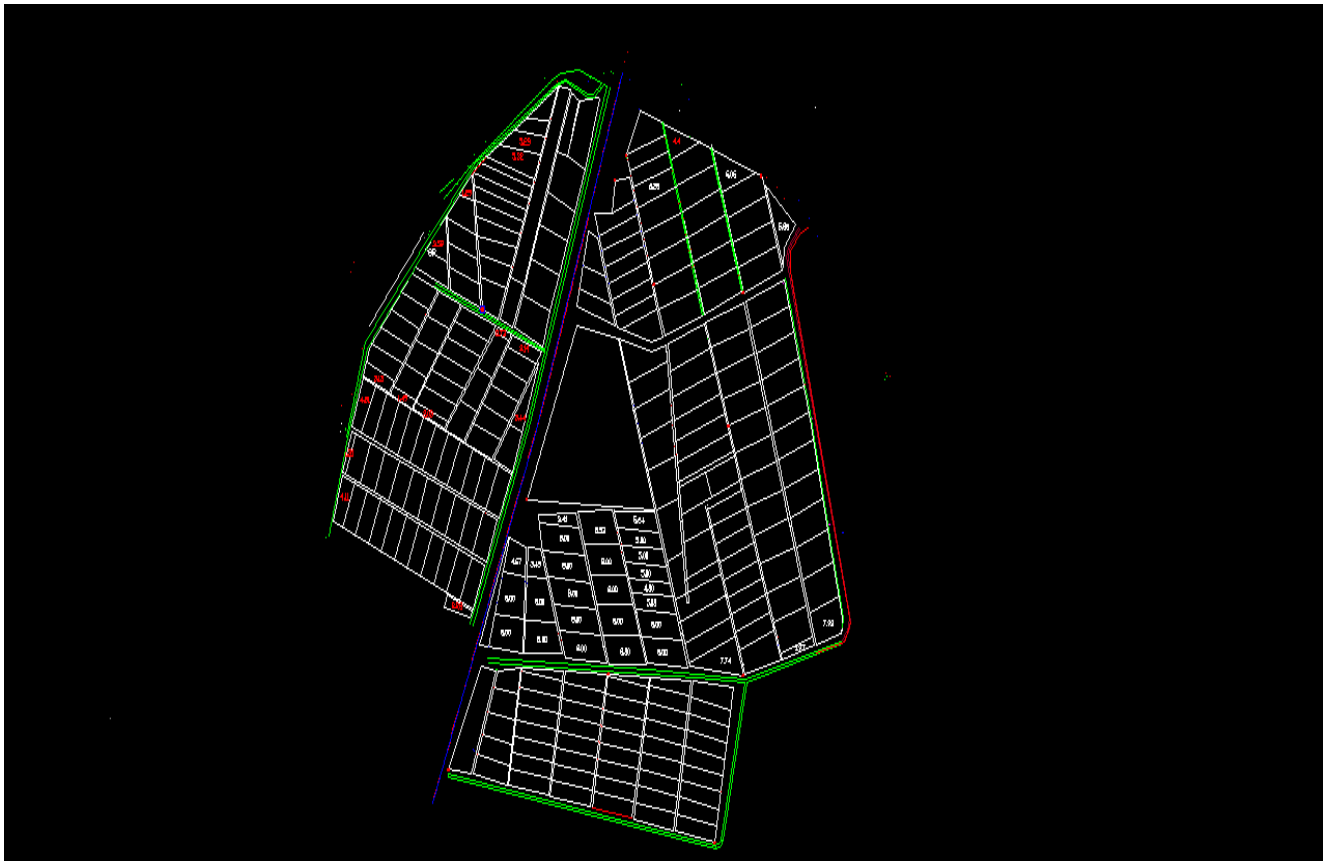
The study area is ElamenElgisaie project in Almukabrab village located in eldammer locality River Nile state. The study area in this project contains 253 agricultural parcels of different areas,the total area is approximately equal 1932 fadans



figure(5.1) River nile state



figure(5.2) The located of ElamenElgisaie In River Nile state



figure(5.3) AutoCad map for ElamnElgisaie project

5.3The construction and georefefencing of the layers for the agricultural parcels :-

The steps of graphical data and coordinates of control points had been aquired for the georeferencing of the cadastral maps as follows:-

5.3.1 The input data:-

The graphical data including:-

(1) agricultural parcels.

(2) Control points of GPS and total station coordinates.

5.3.1.1 The Agricultural parcels layer:-

The map of chosen area(ElamenElgisaie) had been created from total staion coordinates and drawing (Auto cad) software. The digital map file had been

converted from drawing format (dwg) to drawing exchange format(dxf) to be computed with GIS software , in the case of Arcgis 9.3 drawing format is recognized fig (5.4)

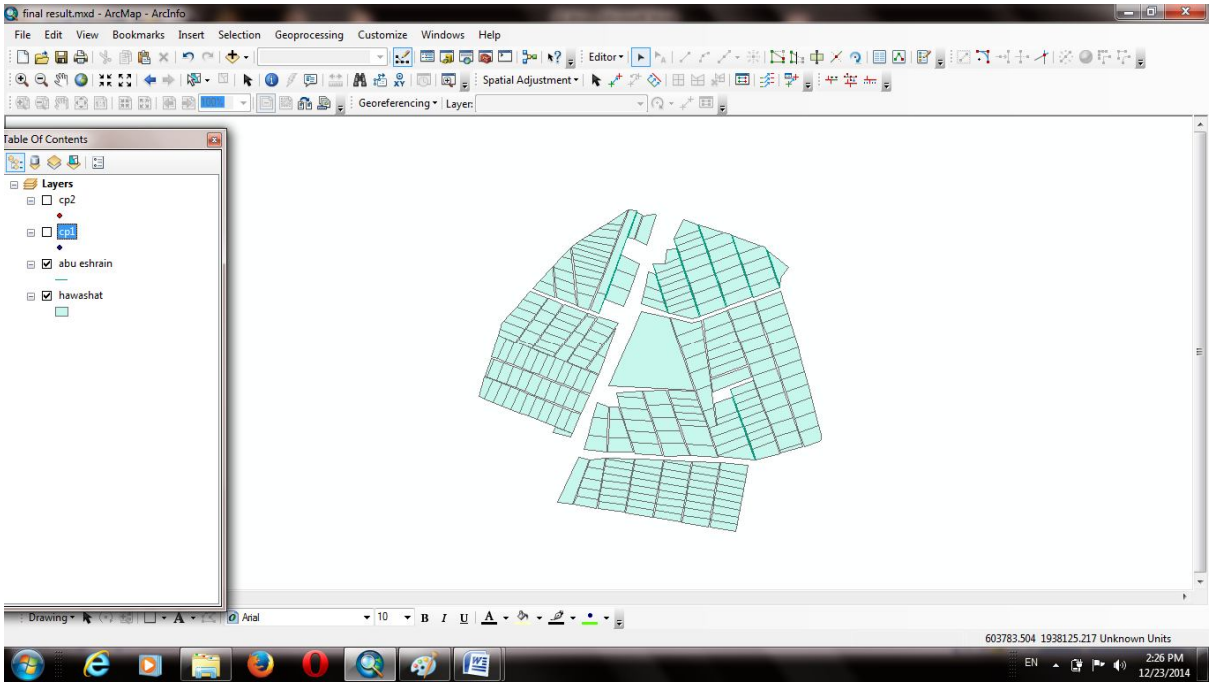


figure (5.4) map ofElamnElgisaiegeoreferencing by totalstation coordinates

The digital map had been converted to shape file by ArcMap and transformed to UTM projection utilizing ArcToolBox fig(5.4).

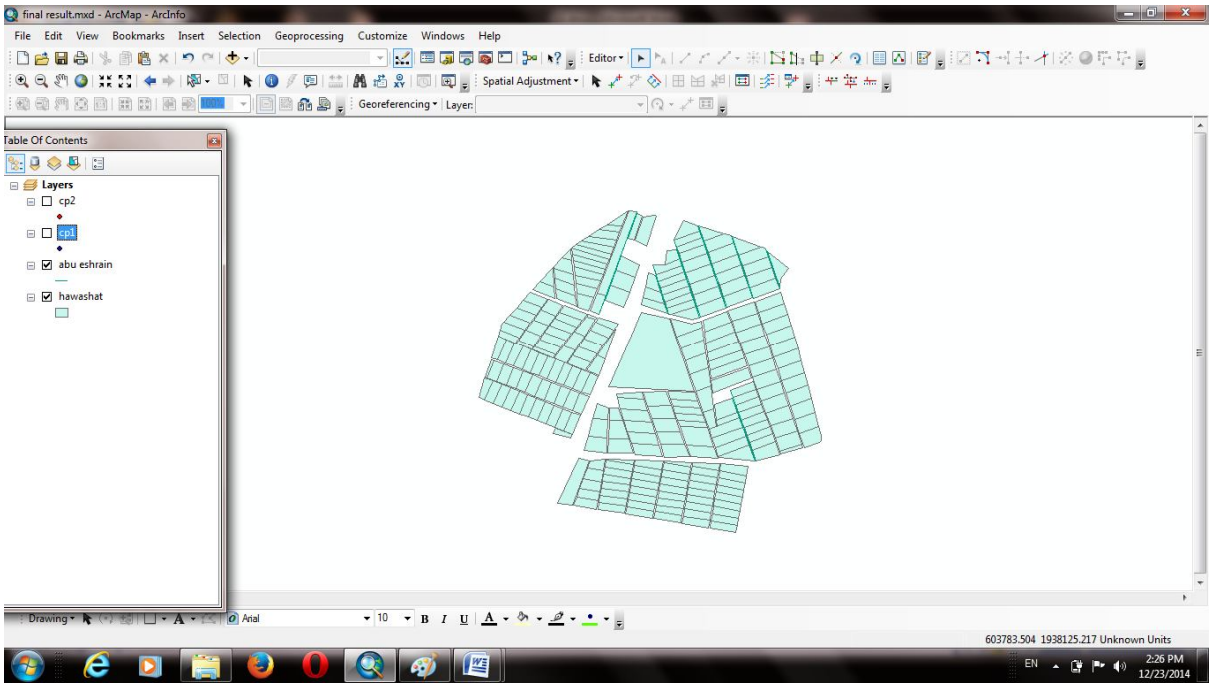


figure (5.5) map transfoming to U.T.M projection

5.3.1.2 Geodetic control points layer:-

Geodetic coordinates had been observed for the four corners of the project on the ground with GPS , two receivers had been used one as a reference on the same points reference of total statio and other as a rover . the reference receiver had been set on a control point in almukabrab village. All observation had been taken referring to this point geodetic datum WGS1984. And projected to U.T.M zone 36N , in fig (5.6).

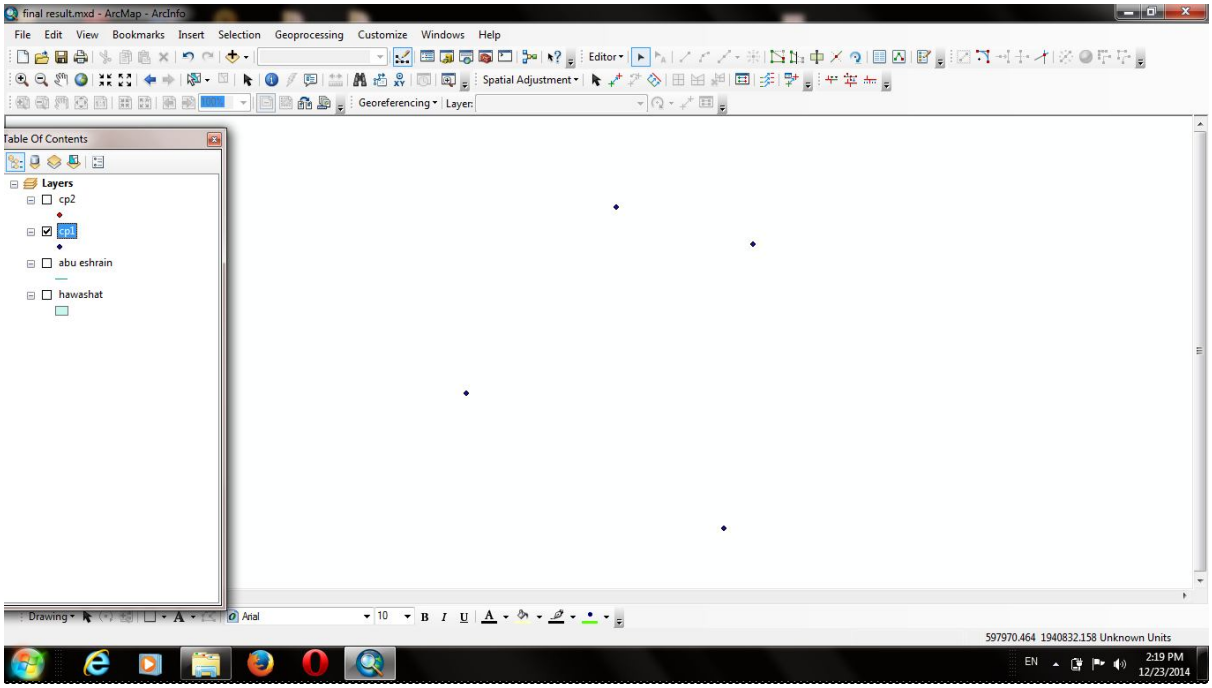


fig (5.6). control points from GPS

The agricultural parcelesgeoreferenced by four points from gps in figure(5.6) . from the map we get the coordinates of other 6 points and calculat the difference between the layar coordinates and ground coordinates in following table figure (5.6)

this four corners observed by total station referenced to one point from gps , after that we obseve 6 point by total station the map in ArcMap which came from outocad had adjusted by 10 station from Total station fig (5.6).

In ArcMap use spatial adjust tools to adjust the map by four point in the corner of project from GPS to calculate the error in another 6 point from total station.

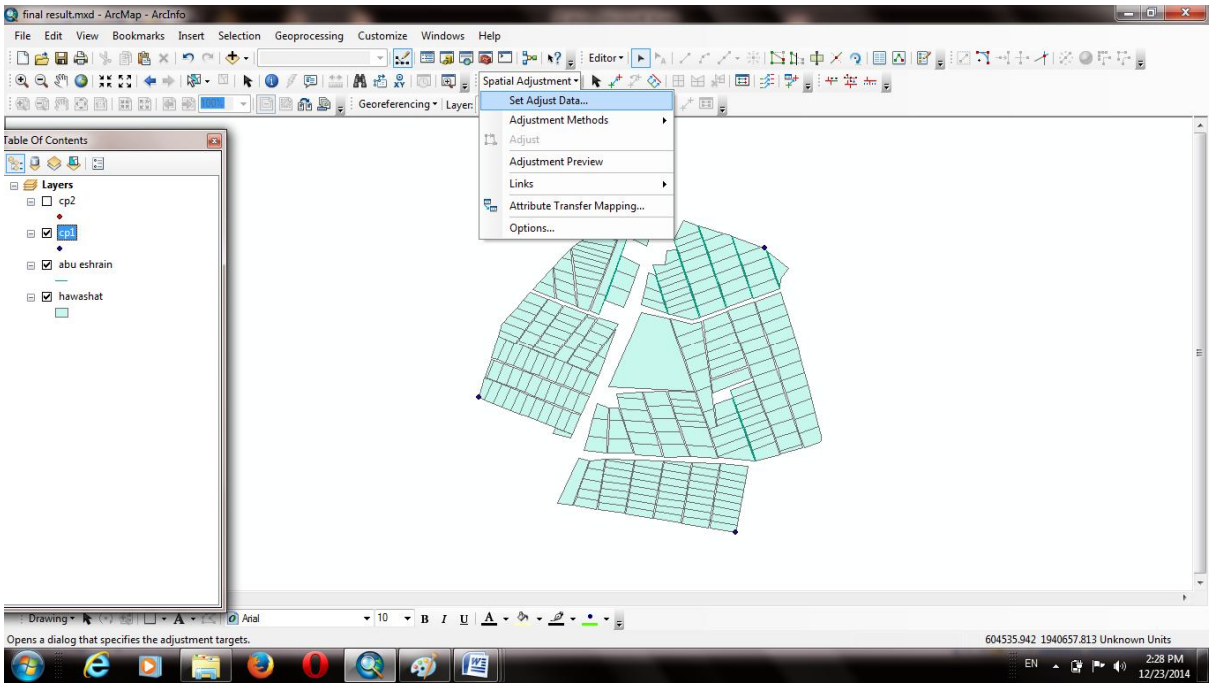


figure (5.6) spatial adjustment for map

In ArcMap9.3 after map adjusted in attribute table of hawshat layer there are some data intered like the name of owner to each peice of land and some data are calculate like area of each peice fig (5.7).

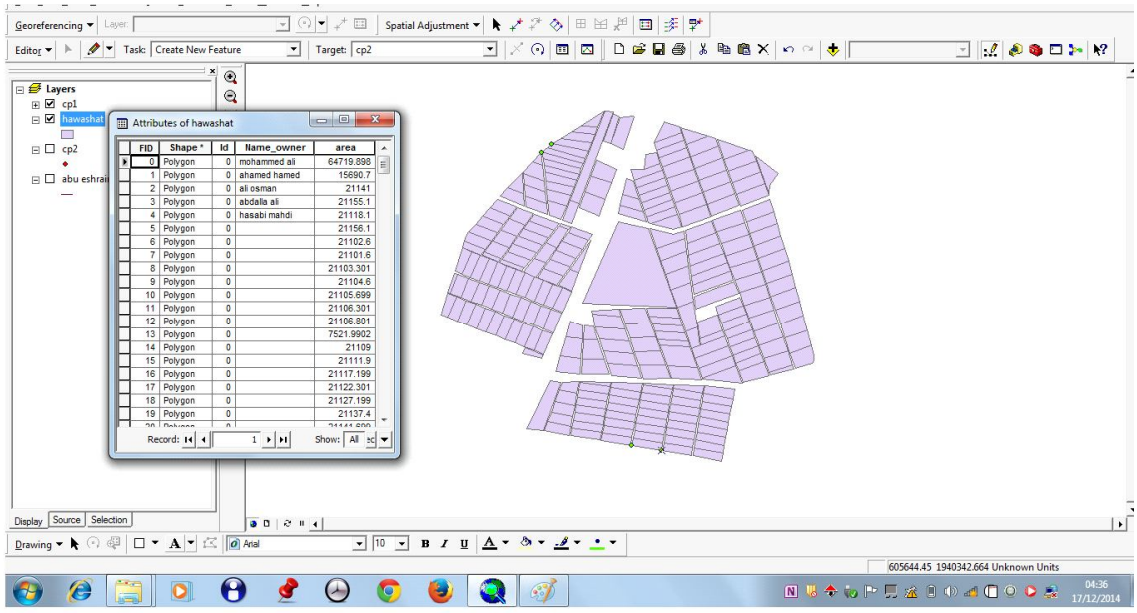


figure (5.7)attribute table of hashat layer

Chapter Six
Results

6.1Test of digital map georeferencing accuracy:-

A set of 10 points had been observed by total station and GPS.Four points are ofthe four corners of elamnelgisaie project which had been observed by centering the instruments directly over each point. A digital map had been prepared for the points using the coordinates of the total station projected to U.T.M projection of defined geodetic datum WGS 1984 using Arcgis9.3 software. All points had been transformed to the GPS coordinate, which are of the same datum and the same projection, using only the GPS coordinates of the four corners as illustrated in table 6.1 below

Table 6.1 total station and GPS coordinates of project corners

	Observation coordinates		Computed coordinates	
ID	**E**	**N**	**E**	**N**
1	604050.211	1939895.991	604050.211	1939895.991
2	605473.311	1939511.2	605473.387	1939511.391
3	605173.402	1936542.554	605173.401	1936542.556
4	602494.846	1937946.221	602494.913	1937946.035

Computing the residual error applying root mean square, which is the fit between the true observed coordinates and the transformed coordinates of the above control points:-

Table 6.2 Residuals of transformed corners coordinates

Observation coordinates		Computed coordinates		ΔE	ΔN
E	N	E	N		
604050.211	1939895.991	604050.211	1939895.991	000	000
605473.311	1939511.200	605473.387	1939511.391	0.191	0.076
605173.402	1936542.554	605173.401	1936542.556	0.002	0.001
602494.846	1937946.221	602494.913	1937946.035	0.191	0.067

Appling equation 6.1:

RMS in E=0.13 and in N=0.10

Computing the shift between observed and transformed coordinates:-

shift = $\sqrt{\Delta E^2 + \Delta N^2}$=0.17 (6.1)

Table 6.3 Residuals of the other transformed points coordinates

	Observation coordinates		Computed coordinates		ΔE	ΔN
ID	E	N	E	N		
1	1939395.894	603483.232	1939395.657	603483.198	0.273	0.006
2	1938914.229	603518.900	1938914.235	603518.867	0.054	0.003
3	1938038.309	605095.528	1938038.320	605095.530	0.006	0.001
4	1938042.059	605107.114	1938042.035	605107.098	0.024	0.019
5	1936600.286	604878.963	1936600.296	604878.960	0.011	0.003
6	1938904.566	603533.774	1938904.512	603533.693	0.010	0.038

Applying equation 6.1:-

RMS in E=0.224 and in N=0.095

Shift =0.25

6.2 Comparison of location accuracy between observed and transformed coordinates:-

To compare the location accuracy between the existed and proposed system, in arcmap9.3 I was make layers one of these for control point which obtained from transformed coordinates from total station , and other control point obtained from GPS first the map is controlled by GPS control points for four points by tool called spatial adjustment and checked by other six points , after that the map controlled by transformation coordinates from total station by same way of controlled by GPS coordinates and calculate the errors in equation no(6.1) and(6.2) in Estaing and nothing and the shifting in coordinates.

Chapter seven

Conclusions and Recommendations

7.1 Conclusions

The GPS and GIS utilized in the design to solve of accuracy problem and any agricultural particles problems which had been discussed in chapter five, this solutions can be conclude in the following:

*the location of each corner of the parcels can be defined on the ground by spatial adjustment of the project by the observing the four corners by GPS.

*The boundaries of any parcels can be relocated with accuracy of 25 cm.

*The digital map of study area and nephrons agricultural project can be link and referring to one coordinates reference frame system.

*A large area can be georefernced with only four corners by GPS.

*A complete data base of spatial data and attributes are obtained.

*capability of adding attribute of parcels such as the name of owners and areas.

*Positional accuracy can be control using GPS layer to solve the problem of displacement.

7.2 Recommendations:

1.Desigen of efficient management model to execute the cadastral system using digital technology.

2. Study of transformation the registration documents from hard copy to digital database.

References :

1. Ahmed Salih Eshamary (2007) geographical information system from start ,the Author ,Baghdad.
2. B. Hofman – wellenhof, H. lichtenegger J. Collins (1993), Global positioning system, springe – VerlagWein New york.
3. Chirsto, (1997) Gis and computer cartography. Oxford.
4. Geographical information system (an introduction) Tor Bernhardsen.
5. Principle of geographical information – Pette-AMC Doneel.
6. Sirkhatim, (1989) LIS and GIS .Sudan University of science and technology.