

SPATIAL INFORMATION IN LAND TENURE REFORM WITH SPECIAL REFERENCE TO KENYA

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Key words: Land tenure, land reform, registry index maps, land information system.

ABSTRACT

A number of land reform programmes, utilizing general boundary survey procedures have been taking place in Kenya over the last four decades with the object of registration of land speedily at minimum cost, in addition to fixed boundary survey procedures which have been used in cadastral surveys for the past century. To date, more than 1.5 million parcels covering over 7 million hectares of land have been registered using general boundary survey procedures. Methods used to bring these properties to the register have mainly involved use of enlarged and unrectified aerial photographs for identification of enclosed parcels on the ground, or identification of larger group ranches on 1:50000 series topographical maps. Ground surveys of an approximate nature have also been used. Though this expediency has satisfied an immediate need in the provision of title to land, it has introduced a number of other challenges to the country in regard to the creation of a comprehensive land information system.

This paper reviews the role played by spatial information in land tenure reform in Kenya and discusses various maps, which are used in support of the reform program. A number of lessons that other developing countries may learn from the Kenya experience are also discussed.

1. INTRODUCTION

Land tenure is concerned with the manner of holding rights in land. It deals with rights, restrictions and responsibilities that people have with respect to land (Dale and McLaughlin, 1999). Land reform programmes usually address the issues of effective functioning of the infrastructure, tenure security and equity of ownership. Land reform programmes are taking place in many parts of the World, especially in the countries of Eastern Europe, South East Asia, Central America and Southern Africa. Provision of accurate and up to date spatial information will continue to form the basis for monitoring of human settlements and other activity on land and aid in close monitoring of land tenure issues.

A land information system needs to be based on accurate, large scale and up to date property mapping which is based on a reliable national mapping framework founded on a geodetic reference network (National Research Council, 1983). The Bogor Declaration (Williamson, 1997a) emphasized the crucial role played by cadastral maps, either in paper

or computer form, in a national spatial data infrastructure. Citing a report for Australia and New Zealand Land Information Council, Williamson (1997b) mentions that cadastral data is the major spatial data set and comprises over 25% of all spatial data produced by spatial data suppliers.

2. LAND TENURE REFORM IN KENYA

The Republic of Kenya has an area of 582,646 sq. km and a population of over 28 million (1999 census). 75% of the population occupies about 20% of the country, which may be classified as medium and high potential areas for agriculture. 80% of the population is rural and agriculture provides employment to 70% of the labour force. 80% of the agricultural work is done by women. Land in Kenya is presently categorized into government land, trust land and private land. Each of these categories has its own peculiarities with regard to land reform programmes. Government land comprises of 10%, private land 20% and trust land 70% of the total land in Kenya (Njuguna and Baya, 2001).

2.1 Trust land

Where land formalization has taken place on Trust Land, unrecorded rights held under customary forms of tenure are been determined after systematic adjudication. This is followed by demarcation, survey, production of registry index maps and issue of title. This is the most extensive land reform programme, motivated by political and agricultural concerns (Sorrenson, 1967 and Swynnerton, 1955), and which has been in place since the 1950s. Agricultural parcels resulting from these reform programmes are mainly on freehold tenure. By the end of 1999, 1.46 million titles to land covering over 7.86 million hectares of land had been issued since land formalization programmes started in Kenya.

Table 1: Progress of land tenure reform in Trust Land areas of Kenya.

Trust land category	Consolidation areas	Enclosure areas	Rangeland areas
Number of titles issued	0.46 million ⁺	1.0 million ⁺	400
Area covered (ha.)	1.3 million ⁺	3.5 million ⁺	3 million
Method of survey	Ground survey (chain and compass)	Identification on unrectified aerial photographs	Identification on 1:50000 topographic maps and ground survey
Maps to support registration	1. Demarcation maps 2. Registry index maps	Preliminary index diagrams	Registry index maps - range (provisional)

⁺ - close estimation

Sources: (Njuki (1999); Mulaku & McLaughlin (1996); Dept. of Land Adjudication & Settlement)

Three different approaches are used in land tenure reform programmes on Trust Land:

- i. Consolidation of land fragments (in consolidation areas) is done where fragmentation is deemed excessive. Fragments owned by individuals are consolidated such that a particular individual ends up with fewer but larger and more agriculturally viable parcels within a particular Adjudication Section. New plot layouts are planned and demarcated on the ground, after allowing for necessary public utilities.
- ii. In Enclosure areas where parcels are not severely fragmented, are fairly well enclosed and economical in size, identification of parcels on the ground is commonly done using enlarged and unrectified aerial photographs. Holdings in these areas require little rearrangement on the ground except where there is need to provide for access to the holdings and other public utilities. Enclosure areas account for the largest number of titles issued in land tenure reform programmes on Trust Land.
- iii. Identification of large ranches in pastoral areas, owned by clans or groups registered under the Land (Group Representatives) Act, 1968, is done on 1:50000 series map sheets. Titles for these expansive ranches are held in the name of registered representatives of the groups. Names of the members of a particular group are kept in the group register for that particular group. Over 400 group ranches covering over 3 million hectares have been registered so far.

2.2 Government land

On government land, land tenure reforms are concerned with transfer of land from the government to individuals. County Councils may also "set apart" portions of Trust Land and request the Commissioner of Lands to issue letters of allotment to particular allottees. Grants from the government (with a few exceptions) are sporadic in locality and time. Government grants may be either on freehold or leasehold tenure, though the majority of the grants are on leasehold tenure. Titles to over 230,000 parcels of varying sizes and user have been issued to individuals by the government over the last century.

2.3 Private land

Land tenure reform on private land in Kenya involves redistribution and substantial change in ownership of land to enable larger numbers of individuals and those hitherto excluded from ownership, to benefit through subdivision and redistribution of smaller parcels of land.

Emerging trends regarding private ownership seem to indicate that there are many subdivisions of land which are not brought to the register in a timely fashion and that the traditional system of land inheritance continues resulting in re-fragmentation of land as discussed in Patel (1977) and Larsson (1971). Substantial transfer of large-scale farms to the Settlement Fund Trustees and land buying companies, cooperatives and self-help groups has also taken place. Increased subdivision of group ranches (group tenure to individual tenure) in pastoral areas is also taking place, possibly indicating a need to

reassess the concept of group ownership. More than 50 registered Group Ranches (about 13% of the total) have already been subdivided into smaller plots and a number of others are in the process of subdivision.

Table 2: Land redistribution reforms in Kenya.

Category	Settlement schemes	Company and Cooperative farms
Total number	320	2700
Number of titles issued	120200	2 million ⁺
Area covered (ha.)	960000	2.2 million
Methods of survey	1. Ground survey methods 2. Stereo restitution 3. Photo identification	Ground survey methods
Maps to support registration	1. Registry index maps 2. Preliminary index diagrams	1. Registry index maps 2. Registry index maps (provisional) 3. Deed plans

⁺ - close estimation

Sources: (Njuki (1999); Survey of Kenya)

3. BOUNDARIES AND MAPS IN THE LAND REFORM PROGRAMMES

Well-defined boundaries and accurate cadastral index maps are necessary for support of land tenure reform programmes. Land reforms in Kenya utilize both fixed and general boundary surveys but the majority of parcels have general boundaries.

3.1 Fixed boundaries

Schemes requiring fixed boundary surveys include:

- i. New grant surveys for allocations from the Government.
- ii. Company and cooperative farms on which shareholders opt for fixed boundary surveys.
- iii. Where land has been "set apart", from Trust Land, by County Councils.
- iv. Where there is need for boundaries previously surveyed under general boundary survey system to be converted to fixed boundary system.

Monumentation for fixed boundary surveys is specified by the Director of Surveys and consists of coordinated and concreted markers at turning points of rectilinear boundaries.

Natural features may also be adopted as curvilinear boundaries. Survey plans and other documentation are examined and approved by the Director of Surveys. Where registration is under the Registration of Titles Act, 1920, (Torrens system) the surveyor is expected to prepare deed plans with respect to each plot which, after signing and sealing by the Director of Surveys, are attached to registration documents. Registry Index Maps are used to support registration of plots under the Registered Land Act, 1963.

3.2 General boundaries

Parcels with general boundaries are registered under the Registered Land Act, 1963. Registration under that Act is backed by registry index maps of varying character. These maps are used in areas where conversion from communal to individual or group tenure. In subdivision of settlement schemes and a majority of company and cooperative farms, even though the original farms had been surveyed with fixed boundaries, the smaller resulting parcels are surveyed with general boundaries to reduce costs and speed up the process.

3.3 Registry Index Maps

Registry Index Maps are maintained by the Director of Surveys and are used in land registries to support issuance of titles. The Registered Land Act allows for use of interim registry index maps for registration of land prior to preparation of more accurate maps. In the earlier days of the reform programmes, interim maps were upgraded through a process, known as "refly", by which maps were plotted accurately by photogrammetric restitution methods after hedges had grown sufficiently to be "air visible". Ground survey methods were then used to mark any missing boundaries. These maps were produced for parts of Central and Eastern Provinces, around Mt. Kenya, and are mostly drawn at scales of 1:2500 and 1:5000. Registry index maps for the One Million Acres Schemes in Nyandarua District, drawn at 1:10000, were produced by this process. The "refly" process was abandoned in 1967 due to its slow speed and expense. A Hedge Inspectorate, which existed within the Survey of Kenya to ensure maintenance of boundary features, was disbanded soon afterwards.

Ground survey methods are used by the Survey of Kenya and licensed surveyors for production of accurate Registry Index Maps in urban areas and in the subdivision of Company and Cooperative farms. Maps for Shirika, Sugar Settlement Organization, Ol'Kalou Salient and Magarini settlement schemes are also produced by ground survey methods.

3.4 Interim Registry Index Maps

The quality of these maps depends on the process used to produce them. This is further complicated because there are no standard specifications for boundary features for general boundaries. Continuous features, such as hedges and fences often mark boundaries, but quite often these features are missing. Though the approximate scale is indicated on interim registry index map sheets, indication of grid lines on the sheets is avoided.

Boundary disputes have been on the increase, mainly due to the poor quality of these maps and inadequate maintenance of boundaries.

3.4.1 Demarcation maps

These maps were produced from tracings of allocation plans in consolidation areas. They were prepared by Junior Survey Assistants, from the Department of Land Adjudication and Settlement, with little training in surveying, using very approximate methods (chain and compass). These maps were sometimes prepared without supervision of the Director of Surveys. These maps are available for some parts of Meru, Embu and Baringo districts. Sorrenson (1967) mentions that there were so many complaints on the quality of the survey work in Murang'a district that land consolidation surveys had to be repeated in many parts of that district between 1960 and 1963. In a few cases boundary surveys in enclosure areas are done on base maps using plane table methods.

3.4.2 Registry Index Map (Provisional)

These are maps prepared from tracings of field sheets made by Junior Survey Assistants from the Department of Land Adjudication and Settlement using ground survey methods in the subdivision of Company and Cooperative farms without the supervision of the Director of Surveys. The quality of these maps is not assured because of little knowledge of surveying by the personnel involved in the ground surveys.

3.4.3 Preliminary Index Diagrams

These maps are produced from enlarged and unrectified aerial photographs. Boundaries are identified on these photographs and subsequently traced to produce Preliminary Index Diagrams (PIDs). These maps comprise the majority of registry index map sheets used in Kenya. It is estimated that they comprise of over 10000 sheets with an average of about 95 parcels per sheet (Mulaku and McLaughlin, 1996). PIDs are also used in Lake Kenyatta and Haraka settlement schemes. The main weaknesses of these maps is non-uniformity of the scale within particular registry map sheet, unreliability of areas calculated using these map sheets and distortion of shapes of plots. Differences exceeding 50% of parcel areas between areas from PIDs and those from more accurate methods have been detected (Mulaku and McLaughlin, 1996). These differences vary with the topography of the land.

3.4.4 Registry Index Maps – Range (Provisional)

These maps support land registration in rangeland areas (pastoral areas) where communal tenure is being converted to group (clan) tenure. Natural features appearing on the published 1:50000 topographical sheet map series are often accepted as boundaries. Boundary markers (pillars), though coordinated to the nearest metre using approximate ground survey methods, are marked on the 1:50000 map sheets but their coordinates are not often used in computation of areas. In many cases areas indicated on title documents differ significantly (by thousands of hectares) from those determined by more accurate methods. Where small public purpose plots are to be plotted at a larger scale, this is done

either as insets or on separate cross-referenced sheets. These maps are found in some districts of the Rift Valley, Eastern and Coast Provinces.

3.5 Sectional Plans

These plans are prepared under the provisions of The Sectional Properties Act, 1987 to support issuance of title to individual units within high-rise buildings. Requirements for preparation of these plans are a medley from those of general and fixed boundary surveys. The Director of Surveys examines these plans before title is issued. It is possible that these plans will find application in informal settlements requiring urgent titling.

3.6 Other maps

Trading centres under the jurisdiction of various County Councils have commercial plots, which are on 33-year leases from the Councils to individuals. Many of the plans showing these plots are sketchy and are not examined nor maintained by the Director of Surveys. Lease documents for these plots are not as valued as those granted by the Government.

4. THE CHALLENGE OF A NATIONAL LAND INFORMATION SYSTEM

The National Development Plan (1997-2001) states that *"Efforts are under way to improve information management and the integration of all users and contributors by computerizing land data and administration procedures. A parcel based information system to cover textual and graphical information, and to interface the two, will be undertaken"* (Government of Kenya, 1996). The Ministry of Lands and Settlement has set up a committee to look into issues related to implementation of a National Land Information System. Three government departments (Physical Planning, Survey of Kenya and Land Adjudication and Settlement) and a number of Local Authorities (such as Nyahururu and Nakuru Municipalities) are in the process of automation of their land records. Many developing countries have begun automation of their land records. Examples of these countries include Botswana, Zambia, Ghana, Madagascar, Morocco, Bangladesh and Indonesia. It is widely accepted that those developing countries which have not developed nationwide land information systems will eventually do so, albeit incrementally.

4.1 Challenges associated with provision of accurate cadastral maps in Kenya

In Kenya, accurate registry index maps will play a crucial role in the creation of a national land information system. Accurate plotting of points on cadastral maps makes the maps more useful and easier to maintain but does not improve boundary definition accuracy because that definition has to be done as a separate operation and documented elsewhere. Good property maps should assist in identification of parcels on the ground, indexing of parcels and determination of areas of parcels. They should also assist in relocation of boundaries, subdivision of parcels, land management, equitable valuation and assessment of property, land planning and facilities management.

Though interim registry index maps have been instrumental in supporting major land reform programmes in Kenya they only assist in indexing and identification of parcels on the ground. In order to be of further use in the creation of a national land information system, upgrading of existing maps and production of new accurate registry index maps at minimum cost is necessary. Mulaku and McLaughlin (1996) indicate that positional errors not exceeding 2m are of sufficient accuracy for property mapping at scales most commonly used for registry index maps in Kenya.

The main concerns related to interim registry index maps that are used in the current land tenure reform programmes in Kenya are:

- i. Current interim registry index maps do not adequately allow for accurate geometric relationships with thematic maps.
- ii. More checks and balances in the determination of parcel areas and boundary location are required. Production of interim registration maps relies heavily on integrity of field officers and concern has been raised (Sherer, (1986) and Sorrenson (1967)) on the need for further checks. Amendment of section 32 of the Registered Land Act in 1987 to allow for inclusion of areas of parcels on title deeds (which had hitherto been known as land certificates) signaled a general dissatisfaction with the quality of these maps. Technical requirements for production of registry index maps were not changed to accompany the amendment. Available technology allows for use of methods that are more observer-independent and can stand closer scrutiny.
- iii. Due to low confidence in interim registry index maps, proprietors of various parcels are not realizing maximum possible benefits from them. Mulaku and McLaughlin (1996) mention that financial institutions generally advance only 40% of the value against titles registered on the basis of these interim maps, as opposed to 90% of the value for titles based on more accurate mapping.
- iv. There are many local systems on which cadastral surveys in Kenya are based. There is also need to harmonize various systems on which many sporadic surveys registered under the Torrens system are based so that cadastral index maps may be compiled.
- v. Most of the monuments in control network the country have been destroyed, creating a need for re-establishment of control in many parts of the country. It is estimated in 1990, that about 60% of monuments in the national control network in Kenya had been destroyed (Okumu, 1990).
- vi. Harmonization of legislation with intent to regulate qualifications of personnel who may carry out title surveys is necessary.

4.2 Possible solutions

For production of new accurate property maps and improvement of existing maps, methods which have proven inexpensive and fast in large scale property mapping should be used. The government should also seek increased private sector participation.

- i. The PID improvement method suggested by Mulaku and McLaughlin (1996) should be tried in areas where PIDs exist. This method utilizes a least squares transformation and is said to progress at a rate 12 times that of ground survey and to cost 14 times less. This method works best where parcel boundaries appear both on the original photography and on the ground and could deal with about 50% of all preliminary index diagrams in Kenya. It is cheaper and faster than ground survey methods and the method of "refly".
- ii. GPS technology has been used in cadastral surveys in countries such as El Salvador, Indonesia, Morocco, Botswana, Namibia, Jordan, and in a number of countries of Eastern Europe (Ericsson and Eriksson, 1998). Tests for use of GPS in Real Time Kinematic Surveys in Belize and Albania (Barnes and Eckl, 1996) have demonstrated that use of GPS in cadastral surveys has considerable cost savings. Similar results have been obtained in Korea and Denmark. A multi-project approach involving a number of projects (such as reestablishment of the national control network, security, monitoring of the movement of the Rift Valley and property mapping) can be adopted to distribute front-end costs.
- iii. Use of high-resolution satellite imagery for upgrading interim registry maps in areas where hedges are fully-grown. This imagery could also be used in Group Ranches where medium scales are used. IKONOS, IRS-IC and SPOT satellite imagery has been used for cadastral mapping in a number of countries such as Jamaica, Argentina, Nicaragua and India.

5. CONCLUSION

Countries using interim registry index maps similar to those used in Kenya need to reexamine continued use of such maps and the manner of their preparation, in light of enabling technologies that are available. There is also a need to put in place the necessary spatial data infrastructure to support large-scale mapping for more effective land management and further land tenure reforms.

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BIOGRAPHICAL NOTES

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