

# THE CADASTRAL SURVEY REQUIREMENTS OF DEVELOPING COUNTRIES IN THE PACIFIC REGION. WITH PARTICULAR REFERENCE TO FIJI

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## ABSTRACT

The cadastral survey systems introduced into many developing Pacific countries during colonial eras often do not meet the social and economic demands placed on them at the present time. Such systems can seriously limit the availability and transfer of land hence restricting the development and economic advancement of a country. This paper considers the subject generally although particular reference is made to the system presently operating in Fiji.

## INTRODUCTION

This paper is concerned with the role of cadastral surveys in developing countries in the Pacific region. The term "cadastral survey" can mean different things in different countries, therefore it is necessary to define it from the outset. In some countries the term refers to the collection of all information which relates to individual land parcels; although in the majority of cases the main component of a cadastral survey is the survey of the boundaries of all the individual land parcels. In the context of this paper the main component will be assumed to be the survey of land parcels. The term "cadastral survey system" will refer to the control and methods of carrying out cadastral surveys. This includes the legal and administrative controls and framework, the personnel involved at a government or private enterprise level, the professional and educational institutions, and the methods and equipment used to carry out such surveys.

The cadastral survey systems operating in many developing countries today have not changed substantially for over 100 years. The systems, which were generally introduced during colonial eras, met the needs of the respective countries for many years. Their suitability in the light of today's technology and the present social and economic requirements of each country, is being increasingly questioned. The inflexibility and cost of many of these systems can seriously restrict the availability of land for development and hence limit economic advancement. The comments in this paper are generally related to countries in the Pacific region which were under British Colonial rule at some stage-the cadastral system in Fiji is used as a particular example.

The survey systems which were introduced into these countries as part of the Colonial land administration are often considered by the present administrators to be the only systems applicable to them and are generally now regarded as "indigenous" systems. The systems are revered, closely guarded and are enshrined in legislation-the Australian and Fiji systems are prime examples. Over the years much discussion and research has been directed towards land administration. In both developing and developed countries however, the majority of change has occurred in the land administration and title registration area, with little change occurring on the survey side. Government survey departments and the surveying

profession have tended to be conservative and adverse to change; however, it must be realized that in most Pacific countries the cadastral survey system is heavily controlled by statute-statutory regulations determine virtually all standards and methods. The determination of these statutes is a political decision although it would be wrong not to acknowledge the strong political influence the professional land surveyor has had on structuring these controls.

The reasons for this conservatism are many and varied but the prime reason must be the investment each country has in its survey system-both in the professional and technical expertise of personnel and in the wealth of survey records. The factors of expertise of personnel and wealth of records maintain a great inertia in any land administration system-an inertia which is difficult to alter although the factors appear to have had more influence on cadastral survey systems for reasons which are not clear.

One contributing factor to the lack of change may be the manner of education of cadastral surveyors together with the articulated system of training them. Much of the material taught or passed on to future surveyors considers cadastral surveying as a static discipline and as an end in itself. The material does not sufficiently promote the view that cadastral surveying is a service discipline within the land administration arena which must keep pace with present demands. Again it is realized that many of the examination requirements of surveyors are controlled by statute which in turn must influence education and training, although as mentioned before the blame cannot rest solely with the politicians.

The conservatism and desire to maintain the *status quo* does not always emanate from the surveying profession. For example, the two most significant attempts at modernizing cadastral systems in Australia have both been proposed by the Lands Departments in New South Wales and South Australia. In the case of New South Wales this was the proposed introduction of I.S.G. (Integrated Survey Grid) [18] during the 1970's and in the case of South Australia a revolutionary proposal to define property boundaries by legal co-ordinates derived by photogrammetry, suggested in the late 1970's [16]. Both systems appear to have been opposed by various legal, bureaucratic, political and professional interests.

In discussing the requirements of cadastral surveying in a developing country it is necessary to consider the performance of any existing system. This requires an analysis of such aspects as its history and evolution, user requirements, and advantages and disadvantages.

## EVOLUTION

It is important to recognize why cadastral survey systems evolved in the form which they have. If this can be established it will assist in making objective evaluations and decisions regarding the amendment or modernisation of a system. For example it may help isolate present policies or procedures which were introduced many years ago for good reason but in the present environment are no longer applicable. Also it may help in understanding which policies were truly designed and introduced to solve a particular problem and which policies were borrowed from another country for expediency and which may not have been fully applicable.

Generally the main factors which affected the early forms of cadastral survey systems in the Pacific countries were:

- (1) The socio-political foundations of the prevailing land tenure system.
- (2) The land policies of the government.
- (3) The system of recognizing and allocating land rights adopted by the government and the nature of the rights granted.
- (4) Nature of emerging settlement.
- (5) The topography, geography and economic circumstances existing at the time of the introduction of the system.
- (6) The "state of the art" of survey.
- (7) The professional background and experience of the individuals or surveyors who introduced the system.

The first three factors determine the principal purpose of the survey system and the remaining four factors influence the technical aspects of the system.

In the case of Fiji, land administration policy was determined by Britain. However, the legal and technical procedures in respect of freehold and Crown land were greatly influenced by Australia. Due to the land policies at the time, the nature of settlement and the influence of Australia, the Colonial government decided to introduce the Torrens system of title registration, together with the precise "fixed boundary" approach adopted for cadastral surveys in Australia. Consequently title registration, which was introduced by the *Real Property Ordinance, 1876* was based on the South Australian *Real Property Act, 1858*. Similarly the *Land Surveys Ordinance, 1877* was derived from the legislation controlling land surveyors in the State of Victoria at that time.

## THE ROLE AND FORM OF CADASTRAL SURVEYING SYSTEMS

It is usually not possible to discuss the role of cadastral surveying without discussing that of title registration. The aim of this paper is not to examine the relative merits of different systems of title registration in developing countries although their role and importance should be mentioned.

Of prime importance to any developing capitalist economy is the ready availability of land. In hand with this should go security of tenure and ease of transfer of land and a title to land which is easily mortgagable to obtain long-term finance. Inherent in such a framework is a cadastral survey system applicable to the needs of the individual country.

The system of title registration which is adopted in many of the developing Pacific countries is based on the Australian Torrens system [26]. Unfortunately many people consider that this is also a "survey" system and that it requires the adoption of a "fixed" boundary system as practised in Australia in order to operate-this is not so.

Primarily a title registration system is a conveyancing tool-as Torrens himself put it when describing the South Australian Act "conveyancing and registration are one and the same thing" [29]. The only requirement of a title registration system regarding survey is that the parcel of land in question can be uniquely related to the ground. To achieve this end various systems have been adopted to define the

boundaries of a parcel [8]. For example the "fixed" boundary system based on isolated surveys has been adopted universally in Australia (with some states making minor variations) while New Zealand and many other countries adopt a similar "fixed" boundary approach but do so within a co-ordinated survey system. Photogrammetry is also used to determine boundaries in a variety of ways; it is used to determine numerical and general boundaries with the use of topographic and orthophoto maps and both rectified and unrectified aerial photographs. Even in Australia and New Zealand, who have some of the most ardent supporters of the "fixed" boundary approach, occupational boundaries are acceptable in law under certain circumstances [22] and the use of general boundaries delineated on large scale aerial photographs is being seriously considered [17].

The type of cadastral survey system adopted depends on many factors, as briefly mentioned, but one aspect which has great influence is whether title registration is to be introduced systematically or sporadically. The ideal is usually a systematic approach although the initial cost of extensive surveys, either by ground or photogrammetric methods is usually high. The sporadic approach usually adopts the "fixed" boundary, isolated survey approach used in Australia, since initially it is the cheapest and quickest method. Also in Australia and other countries which developed under similar circumstances this was the only realistic approach available at the time. One factor in favour of a sporadic approach is that the individuals requiring the survey can be made to pay for it immediately-this is the case in most Pacific countries including Australia and Fiji. On the other hand the initial outlay for surveys, which is a prerequisite of the systematic approach, would most probably have to be paid for by the government, although the costs could be recovered upon registration of individual titles.

It is accepted that the basic purpose of a cadastral survey in the Australian context is to meet the legal requirements for the issue of titles but it is often forgotten that there is a secondary benefit of the survey-the building of a cadastral base for a country. It can even be argued successfully in many developing countries that the existence of a good multi-purpose cadastral base is more important to the state from a land management point of view than title registration, the benefits of which are basically gained by the individual landholder.

#### COMMENTS ON ACCURACY

Much has been written on the accuracy requirements of cadastral surveys which will not be discussed here, but of paramount importance in considering such matters is the determination of the user requirements together with the appropriate methods and specifications of the survey. Two authoritative quotations summarize the approach which should be adopted with regard to accuracy of cadastral surveys in developing countries. The first by Prof. A. J. van der Weele at the United Nations' Inter-Regional Seminar on Cadastral Surveying and Urban Mapping in West Berlin, 1974 [20].

..If cadastral surveys in developing countries were carried out according to the sophisticated procedures established (though, in fact, only partly carried out) in the developed countries, the consequence would be great expense and slow progress. The contribution of such a cadastral survey to the development

of the country would therefore be small, and probably very inefficient having regard to cost."

The second was a resolution adopted at the U.N. Regional Cartographic Conference for Asia and the Far East held in India in 1955 [19] which stated:

"The precision of a cadastral survey should not be more than necessary for the fulfilment of practical requirements. The system, the method of production, and the legal basis should be adopted to local circumstances both social and physical."

One important aspect which is relevant to any discussion on the accuracy and specifications for survey is whether the surveys will be carried out solely by government surveyors or if private surveyors will be involved. If the surveys are carried out only by the government it is relatively easy to maintain standards and control procedures, thereby permitting a more flexible survey approach when required. However, if private surveyors are involved it will be necessary to introduce more stringent standards in order to maintain "quality control".

#### THE AUSTRALIAN APPROACH

Considering the influence the Australian survey system has had in the Pacific region it is worth examining it in some detail so as to better appreciate the system which was "exported" to various countries. The system which developed in Australia did so for good reason. The problems confronting surveyors during early settlement were enormous: surveys were required over a vast, sparsely populated area; the demand for land was such that the official surveys for Crown grants lagged far behind occupation; there was a shortage of surveyors, therefore the quickest and most expeditious methods of surveying were adopted: the topography and vegetation were generally harsh with a lack of natural features with which to describe properties; and since the early settlements were principally established for convicts the military administration at that time had problems enough-a national survey and mapping scheme could neither be afforded nor was it considered. Considering the circumstances, the survey system which developed was the only course of action available. As mentioned previously the "fixed" boundary approach developed in an isolated survey framework. Basically each boundary in this system is "fixed" by being related to an artificial monument placed at each bend in the boundary. Ideally each parcel is tied into the adjoining parcels by common boundaries, but other than this each parcel "floats in isolation". With some modifications this is the system which is still in use in all states of Australia today. In view of today's technology and the demands placed on cadastral surveys by government and society, the system must be given a poor rating. It is expensive: it requires a highly qualified professional person to carry out a survey within the system; and yet its benefits are limited as compared with many other systems. The system has been refined to a large extent over the years to the point where it operates relatively well within its guidelines: unfortunately no amount of refinement can change the fact that the "isolated" survey approach, which is the basis of the system, is out-dated and no longer applicable. It is hard-ening to see that there are moves towards introducing integrated surveys into some Australian

states, however it may be many years before their influence in the cadastral sphere will be felt.

Since each parcel is surveyed in "isolation" it has been difficult to relate the legal boundaries of land parcels to the large scale topographic maps within the country. In fact, in N.S.W. the isolated survey plans are overlaid onto the orthophoto series of maps for the State, and by correlating boundary features, the legal boundaries are transferred and built up on the maps-most states are experiencing similar difficulties to these.

The use of the Australian form of survey system in a multi-purpose role is summarized by Harry [12]:

"Where cadastral maps are established to form the basis for the implementation of the Torrens Register, they are incomplete and constitute merely 'insular maps', since only those private parcels for which registration is applied for are included. Insular maps of this type are useless for multi-purpose cadastral documents."

The above described survey system is often considered to be part of the Torrens system of title registration and has consequently been "exported" with this highly successful system on numerous occasions. It is important that the countries which adopted the system realize its history and shortcomings, and are flexible enough to modify their systems if required.

The main aim of this paper is to promote flexibility in any survey system, particularly in developing countries. No one system can meet all the circumstances in a country considering differences in topography and geography, and must be open to modification so that it can better meet the needs of the country.

#### CADASTRAL SURVEYING IN FIJI [9]

As an example of this need for flexibility, a large title registration project is examined in Fiji. The cadastral survey for the project [2] was carried out jointly by the Fiji and Australian governments as part of an Australian aid programme. The method of survey adopted was laid down by law in the *Surveyors Ordinance*, 1969 and the *Surveyors Regulations*, 1954 which generally follow the classic Australian survey approach previously described [25]. A modified approach to the survey is discussed which could have led to substantial reductions in costs for the project with a significant increase in benefits to Fiji.

Briefly the project consisted of surveying approximately 45 000 acres of land previously owned by the Colonial Sugar Refining Company and bought by the Government of Fiji in 1973. The land comprises approximately 1% of Fiji's total land area and is generally regarded as being some of the best agricultural land in Fiji. The land is occupied by tenant farmers on lots ranging from 6-25 acres. It is generally undulating, with some flat and hilly areas. It is intensively farmed with each lot usually being well defined physically [28], as described by Dawson and Kennedy [3]:

"The boundaries of the farms and marginal lots usually follow such natural features as ridges, gullies, watercourses, creeks, rivers and are bounded elsewhere by access roads, constructed drains, and the tramline used by the Fiji Sugar Corporation to transport harvested cane to the mills."

Even though the majority of boundaries are physically well defined by either natural or man-made features there are a percentage of artificial boundaries within the survey area ranging from 0-30% depending on the location.

The aim of the project is to issue a registered lease for each holding under the *Land Transfer Act*, 1971, to each tenant farmer. This Act, which is based on the Torrens legislation, requires a legal survey as described previously, to be carried out.

Briefly the procedure adopted by the project was to adjudicate the boundaries in an area by consultation with the tenant farmers; to mark and survey all lots, roads, drainage easements and railway reserves; and to prepare the plans of survey. The issue of leases was to be carried out by the Fiji Department of Lands and Surveys. The project commenced in October 1974 with anticipated completion in 1983 [4].

The main function of the survey was to facilitate the issue of registered leases for all the lots. This was to give the tenant farmers increased security of tenure and a mortgagable interest in the land which would allow long-term borrowing and hopefully lead to increased investment in the land and possibly an increase in productivity. It appears that the tenant farmers feel that the leases will give them an increase in security of tenure although from a recent court case in Fiji [21] it appears that the *Agricultural Landlord and Tenant Act* [23] (A.L.T.A.) gives greater security of tenure than a registered title under the *Land Transfer Act*. One of the advantages, however, of a registered lease is that the tenant farmer has guaranteed rights in the land during the currency of the lease which are transferable through sale or inheritance (subject to the landlord's prior consent)-this may not be the case under A.L.T.A.

Regarding the benefit of the availability of long-term credit, it appears that the tenant farmers are well served for short- and medium-term credit, especially for agricultural purposes, and that considering the small farm structure in Fiji, the availability of long-term credit may not necessarily lead to an increase in productivity [10].

A secondary benefit of the survey was seen to be that it would define and mark physically on the ground all boundaries within the survey area and hence assist in resolving any existing or future boundary disputes. Considering the size of the project and the number of boundaries measured, undoubtedly the survey will achieve this aim in some circumstances, particularly where boundaries are defined which do not follow any physical feature. However in some cases the precise fixing of the boundaries may have brought disputes "to a head" which would have lain dormant for many years and would finally have been settled by prescription and limitation. It should be remembered that the settlement pattern in these areas has been established for many years and generally the boundaries are firmly established by either natural or man-made features. Also in many of the individual surveys a large number of the boundary marks placed fall within the cultivation and are subsequently disturbed or destroyed-this factor is of little concern to the tenant farmers since in their eyes their boundaries are generally not defined by the artificial monuments but for all practical purposes by physical features-features which are plainly visible, e.g. the physical boundary of a road or railway, or the edge of a 2 m deep drainage ditch.

The third benefit of the survey is that it provides an inventory of all the lands

surveyed with details of the registered tenants. It records the mathematical frame- work of all the pre-existing boundaries, be they of farm lots, roads or reserves, together with all the respective areas of the parcels. As an aid to general land administration in Fiji this is a significant though limited contribution.

#### AN ALTERNATIVE APPROACH

A suggested alternative to satisfy the survey requirements for the issue of leases is the use of a combined general and fixed boundary approach based on ortho- photo maps [III]. It is an approach which has received substantial support in recent years, especially in developing countries. The approach is even more attractive since in the last couple of years Fiji has received large scale orthophoto map coverage over most of its agricultural areas-this coverage amounts to nearly 10% of the land area of Fiji. The major portion of the land being surveyed for leases is already covered by these orthophoto maps.

Considering that the orthophoto maps were produced from "scratch" the survey control used for their production could have been intensified and monumented in a permanent manner so that at least two such monuments would fall within the coverage of each map. Once the orthophoto maps (say at a scale of 1 :2000, although smaller scales could be used) are produced and the control placed, boundary adjudication could proceed in a similar manner to the present method [5]. The end result, a plan showing all lots, roads, reserves etc., could be produced as an overlay of the matching orthophoto map and for all intents and purposes would be identical to the present maps produced by ground survey methods except there would be no bearings and distances on many of the boundaries. Those boundaries which do not follow easily identifiable features could be "fixed" and the bearings and distances of the boundaries, and the co-ordinates of the terminal points could be shown on the overlay. Due to the avail- ability of control, if any "general" boundary was required to be "fixed" in the future it would be a simple matter to determine it by ground methods. This approach is possible since Fiji already has a very good triangulation network covering all the major islands [7].

The major obstacle to be overcome by using this approach is the amendment of the *Land Transfer Act*, 1971-technically this is not a problem. For an example of legislation utilizing a combination of "general" and "fixed" boundaries to define land parcels refer to the model statute for title registration in Simpson's book titled "Land Law and Registration" [24].

Some comments should be made regarding the determination of boundaries by graphical means utilizing orthophoto maps. The method is not intended to achieve the centimetre accuracy of ground methods as outlined in the *Fiji Surveyors Regulations*, 1954 (under ideal conditions it is possible to scale from orthophoto maps to an accuracy of 0.2 mm at map scale--0.4 m on the ground for a 1: 2000 map). The use of photogrammetry achieves a constant accuracy of determination of co-ordinates over large areas-this is referred to as absolute accuracy. Ground survey methods, as described in the above regulations, are designed to give high relative accuracy and generally low absolute accuracy, although depending on the techniques used good absolute accuracy may also be achieved. It is important to remember that the "isolated" survey approach, as adopted in Australia, requires

this high relative accuracy to operate-this is why such a precise survey system developed. Absolute accuracy over large distances is of minor importance in such a system.

Another consideration is that the "isolated" survey approach in Australia is designed for sporadic, not systematic surveys, as is the case in this project. The orthophoto approach, on the other hand, is ideally suited to the systematic approach.

#### ADVANTAGES OF THE ALTERNATIVE ApPROACH

The most immediate advantage of the above described approach is in COSI savings. Initial investigations have indicated that by using an orthophoto approach. the costs for survey could be significantly less than the present ground survey method.

Of secondary benefit to the tenant farmers but in fact of prime importance to the nation. is the possibility of creating a multi-purpose cadastre by using this approach. As well as achieving substantially the same benefits as ground survey methods. the orthophoto maps, with the cadastral overlay. could be used for a multitude of other uses [14]. For example in rural areas where the project is located the maps may be used for valuation and assessment. land use planning. utilities and services. census information. agricultural planning administration, transportation studies. preparation of land inventories and drainage and irrigation facilities. as well as the major uses of registration of title and boundary definition. For a full discussion of the requirements for surveying and mapping utilising a multi-purpose approach most suitable for countries of the South Pacific region refer to a paper given by I. F. Stirling, Surveyor General. New Zealand. at the Pacific and Regional Meeting of the Commonwealth Association of Surveying and land Economy (CASIE) in Fiji during 1977 [1].

One difficulty of utilizing an orthophoto approach is that it implies a dependence on capital-intensive technology as a base, with the cost of such technology outside the reach of most small developing countries. The system does however have the advantage that once the orthophoto maps have been obtained the survey tasks can be carried out primarily at a technician level under the supervision of a professional surveyor .

#### THE ApPLICATION OF THE ALTERNATIVE ApPROACH TO THE SURVEY OF NAnVE LA-DS

In a similar manner to many other Pacific countries, Fiji maintains two land tenure systems. The system which has been discussed so far in this paper is based on the Torrens system of title registration. This system basically relates to land under statutory tenure where the relationship between the registered proprietor and the State is direct and clearly defined. It is generally associated with economic development and the tenure of Europeans and Indo-Fijians. The other is the Native Lands Register which reflects land ownership associated with non-statutory customary tenure-the tenure of the Fijian owner-occupied land where subsistence farming still prevails.

Lloyd [6] has suggested that as long as these two distinct systems of land law, administration and tenure continue there will exist two nations in Fiji-this will mitigate against the evolution of a national land management system. If all the

land was to come under one system it would most probably necessitate all the native lands receiving a registered title under the *Land Transfer Act*-a proposal in fact which has been considered in Fiji for many years. If this was the case it would not be possible to survey all the native lands (which comprise about 80% of the land area of Fiji) under the present law relating to survey and some other approach, such as that outlined in this article would have to be adopted. This is not such a radical approach for Fiji since titles were issued over native lands using a similar approach in the 1960s [14], although as mentioned the approach has not been adopted for land registered under the *Land Transfer Act*.

Another problem experienced with native lands in Fiji at the present is the difficulty in making these lands available for development. Of all the leases permitted

over native lands [15] more than two-thirds have not been registered, mainly because of the high cost of survey under the system [6]. Again the benefit is seen of having the flexibility in a system to allow a cheaper graphical determination of boundaries where applicable. Interestingly the use of orthophoto maps for issuing registered title over customary land is suggested for adoption in Papua, New Guinea where similar problems are being encountered [13].

#### CONCLUSION

Many survey systems in developing countries should be reviewed to assess whether they are meeting the economic and social demands presently placed on them. This is particularly so in the case of a system, such as Fiji's, which was 'imported' from another country over 100 years ago to meet the socio-political and economic circumstances prevailing at the time, and has not changed significantly to the present. Such countries now find that their survey system is contributing to the holding back of development and the restriction on the availability of land at a time when they can ill afford it. These countries should be encouraged to establish professional standards and techniques which are applicable to them and should DO NOT adopt standards from developed countries without careful consideration [27].

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4. Dawson, J. H. and Kennedy, W. D. *Op. cit.*, p. 2.
5. Dawson, J. H. and Kennedy, W. D. *Op. cit.* pp. 4-5.
6. Discussions with Mr. D. T. Lloyd, O.B.E., previously Director of Lands, Mines and Survey and Chairman, Native Lands Trust Board, Fiji.
7. Dutl, B. and Volavola, M. *History of Land Surveying in Fiji*. Ministry of Lands and Mineral Resources, Fiji, 1977. pp. 35-39.
8. For a comprehensive coverage of the methods used to define cadastral boundaries refer to Simpson, S. R. *Land Law and Registration*. Cambridge University Press. London, 1976, Chapters 8 and 18; also Dale. P. F. *Cadastral Surveys within the Commonwealth*. H.M.S.O. London, 1976.

9. For a detailed discussion of land policy in Fiji during the period of British Colonial rule see Lloyd, D. T. *Land Policy in Fiji*, Department of Land Economy, University of Cambridge, (awaiting publication).
10. For a discussion of the effect of credit on productivity of small-scale farms in Fiji, see Anderson, A. G., *Indo-Fijian small farming. Profiles of a peasantry*. Auckland 1974 and Shaw, B. D., *Rural Credit for seasonal cash crops: Indian cane farmers in Fiji*. Ph.D. thesis, Australian National University, Canberra, 1973.
11. For a detailed discussion of the use of orthophoto maps for cadastral surveys refer to Visser, J. "The use of large scale orthophoto maps in cadastral survey, and for rural and urban development projects", I.T.C. Journal, 1976-2.
12. Harry, H. Photogrammetric cadastral survey and land registry, *World Cartography* 12.
13. Hunt, J. N. *The History of Customary Land Registration*. 13th Survey Congress, Association of Surveyors of Papua New Guinea, Lae, 1978.
14. In fact that approach is not new to Fiji (see Ref. 16). About 20 years ago much of the agricultural land in Fiji was covered by low level vertical photography. The resulting photo maps were used for legal, taxation, agricultural and engineering purposes in some areas. In particular the photo maps were used: for the valuation of Fijian owned land for rating purposes; for the registration of mataquali lot boundaries by the Native Lands Commission; by C.S.R. to estimate crop growth; and by the Public Works Department for road location. It appears that the approach was never seriously contemplated for definition of cadastral boundaries for land registered under the *Land Transfer Act*, which is the case regarding the land under discussion in this project.
15. In order to obtain a lease over native lands, the parcel must be surveyed under the *Surveyors Ordinance*, 1969 and registered under the *Land Transfer Act*, 1971.
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21. *Raju v Lal*, Fiji Court of Appeal (No.48 of 1976).
22. *Real Property (Registration of Till's) Act*, 1945, s.9(1) (South Australia); *Transfer of Land Act*, 1954, Part II, Div. 2, s.20. *New Transfer of Land Act*, 1958, (Victoria); *Real Property (Conversion of Till's) Ordinance*, 1967, Part II, s.10. (Australian Capital Territory); *Real Property (Amendment) Act*, 1976. Part IV B (New South Wales); and *Land Transfer (Compulsory Registration of Till's) Act*, 1924. (New Zealand). For a general overview of the use of occupational boundaries in Australasia refer to; Williamson, I. P. and Holstein, L. *Aspects of Title Survey in Australia*. 21st Australian Survey Congress. Adelaide, 1978.
23. See *Agricultural Landlord and Tenant Ordinance*, No.23 of 1976, Chapter 242 and Act. No.35 of 1976, to *Amend the Agricultural Landlord and Tenant Ordinance*,
24. Simpson, S. R. *Land Law and Registration*. Cambridge University Press. London. 1976, pp. 487-492.
25. The Fiji legislation, in a similar manner to that in the Australian states, also permits cadastral surveys to be carried out by the use of photogrammetry; however, the legislation requires that the photogrammetric approach should meet the same accuracy requirements as the precise ground survey methods laid down in the regulations. From a practical point of view photogrammetric techniques cannot meet these requirements, especially over relatively short distances. Consequently, in the vast majority of cases, photogrammetry cannot be used in Fiji for cadastral surveys.
26. This is not entirely correct. For example in Fiji there is in addition a second form of title register which is concerned with the rights of native owned land, the Native Lands Register-in fact this register accounts for about 80% of all land in Fiji. Individual interests are not registered, as is usual under the Torrens systems-rights are registered under the various "mataquali"-the customary land holding unit adopted in Fiji. The 'general boundaries' approach using plane table techniques was adopted to delineate the boundaries of the individual parcels. The major difference between the Native Lands Register and a Torrens register is that the former is a permanent record of mataquali ownership, since native lands are inalienable, whereas the later is designed to facilitate an efficient conveyancing system.





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