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SPRING REVIEW OF LAND REFORM

CADASTRAL SURVEYS

by

Kenneth B. Platt  
PPC/AID/Washington

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## I. GENERAL DISCUSSION

Cadastral surveys, as the term applies in U.S. usage, are concerned primarily with determining and laying out the boundaries of parcels of land for defining individual ownerships.<sup>1/</sup> This is the basic function which provides the foundation for land titles and for relating particular land tracts to particular persons or other legal entities.

Inclusion of cadastral survey information under headings on land identification and titling in the country paper structural outline rests on this concept. Properly performed, cadastral surveys determine, for each particular ownership tract: 1) where the land is situated, 2) its boundaries and surface area, and 3) its separable identity both graphically on a map and physically on the ground. These are the minimum ingredients for establishing sound land titles. Such added information as land use and capability classification, tax valuation; slope, drainage, vegetative cover and other physical data, may be conveniently related to this identity framework for land administration or resource development purposes.

For taxation and other purposes of public administration, these facts about land have concerned governments in some degree from very ancient times. At least as early as 3,000 B.C., according to Dowson and Sheppard,<sup>2/</sup> Egyptian land records included this information, based on direct visual inspection

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<sup>1/</sup> Surveying Our Public Lands, U.S. Department of the Interior, Bureau of Land Management, 1969, p. 4. Also see: Agrarian Reform - Land Transfer Study. Report of the U.S. Department of the Interior, BLM, to USAID/Brazil, 7/11/66 p. 10.

<sup>2/</sup> Dowson, Ernest, and V.L.O. Sheppard, Land Registration, H.M. Stationery Office, London, 1956, P. 1.

by the recording officer.

The ancient Egyptian and other early land record systems were concerned chiefly with fixing the tax potentials of the land and identifying the persons from whom the tax could be most satisfactorily collected. Under the limitations of travel and communications prevalent until recent centuries, central governments tended to treat these matters with very broad strokes. A common procedure was to relate tax demands first to the levels of personal luxury and public ambition of rulers they sought to gratify, and second to the apparent tax yield potentials reflected in the comparative populations of various provinces. The matter of collections was then assigned at the level best balancing the compulsions of central power and its responding loyalties against the temptations of the tax collectors to divert undue portions for feathering their own nests. This approach did not involve the central authority in matters of locating or assessing particular land tracts, or addressing the tax to individual land owners or users. Nevertheless, the tax ultimately fell on particular tracts and their respective beneficiaries, necessitating positive identification of each. In due time, at some appropriate level in the system, land ownership and use registers were established and kept.

In most older countries land registers still rest largely on community familiarity with the land and consensus in its rightful holders, rather than on officially installed, accurate, and indisputable land boundary delineation. Modern cadastral practice, by contrast, has evolved systems of land records utilizing the precision techniques of civil engineering and aerial photography to locate, measure and mark all ownerships on the ground, and to produce accurate

plats of these ownerships. Based on these identities, objectively dependable land title records are constructed and maintained.

In countries practicing private ownership of land, the land title is the crucial instrument in the land use system. The accuracy and legal clarity of the title therefore are of paramount importance. Lack of defensible land titles, and of stable land use rights, have been serious impediments to orderly and adequate development of agriculture in most currently underdeveloped countries. As such, they have been central concerns in many land reform programs.

For these reasons the question of what use has been made of cadastral survey information in actual land reform experience is of considerable interest. A more important question is what effects the land identity record may have on future stability of gains made under current reform programs.

A study of the country papers presented in the 1970 AID Spring Review on land reform discloses that where adequate cadastral (land) surveys existed prior to reform they have been used to good advantage. Their absence emerges as a serious obstacle to security of private title and to effective land possession. Countries having large areas of privately held uncultivated arable lands have made little or no progress in land distribution or in improvement of tenancy until identifying cadastral surveys are made. Countries where essentially all cultivable land already was in use sometimes have been able both to redistribute excess holdings and to improve tenancy conditions, without prior cadastral surveys, but they have not been able to give secure land titles.

In countries where reform is communistic and private land titles are expunged, cadastral information may be largely irrelevant. Exceptionally in Yugoslavia, where some rights of private title have been restored, new cadastral surveys have been used both for forming and for dissolving collective farms. These various relationships are shown in the country comparisons on following pages.

Ten countries were omitted from the detailed country comparison for lack of sufficient data. The following relevant information for these 10 countries is noted: Italy - No mention of cadastral surveys in country report, although their existence seems implicit in the dominant pattern of small owner-operatorships. Kenya - Main emphasis is on confirmation and consolidation of indigenous holdings not previously titled, using aerial photographs. Nigeria - "Problems are caused when witnesses to oral leases forget the clause or die. Boundary lines and amount of tribute to be paid become subjects of endless litigation." Turkey - "The existing land-holding situation ... is far from clear. Title to much land has not been registered and the cadastral survey is proceeding very slowly." Pakistan - No mention of cadastral surveys in draft country report.

Indonesia - "Since in 1961 no exact figures were as yet available... the central committee estimated the total land to be assigned for allotment at 966,150 ha. ... A report of the Agrarian Minister in 1965 gave the following ... difficulties met in land reform: a) deficiencies in the registration of land hampered investigations of the land surplus, and opened the way to abuses." (The government paid twice for some land.)

North Vietnam - Rights to land based on village land (tax) register; system neglected or destroyed, bringing "innumerable disputes". After 1925 the French started a cadastral survey. No information on possible use of existing cadastral surveys in land reform proceedings, "but land reform in no way depended on them."

Cuba - No information, but presumably cadastral surveys to good standards existed for all large estates before reform, and could have been used.

Guatemala - The Law of Agrarian Transformation (1962) "also considered the necessity of doing a cadastral survey to assess the country's idle lands."

Chile - No mention of cadastral surveys in country report.

It may be stated categorically out of the experience reported for this review that no distribution of public lands or redistribution of private lands may be expected to be stabilized until clear and legally secure titles have been conveyed, and until security of possession is assured. The relative degrees of security of title and possession among the 20 countries compared below are seen to be directly related to the adequacy of cadastral surveys. Where surveys are complete and up-to-date, security of title and possession are high. Where surveys are lacking, titles are unclear and vulnerable to legal attack, and possession is open to encroachment and/or usurpation. Reports from such countries as Iran, India, Nigeria, Colombia, Bolivia, and Brazil, where cadastral survey information does not provide clear ownership boundary delineation, show land rights conditions ranging from uncertain to chaotic, with corresponding degrees of litigation, community embroilment, administrative corruption, and obstacles to development.

The historic use of cadastral records principally for taxation purposes perhaps accounts for the neglect of their value for general land administration and use purposes in many countries today. In older countries with crowded agriculture, village land registers based on community consensus have served adequately to identify who is liable for taxation on the various settled land parcels, while community awareness has served to keep taxation rates reasonably well equalized in relation to land productivities. In many of the newer countries with large individual ownerships and much undeveloped productivity potential, dominant landholding classes have preferred vague identification and measurement of their holdings as a shield against rational taxation. In both instances, the result is absence of engineeringly accurate surveys to map the lands, measure them, and mark their boundaries for positive and objective identification by parties not already familiar with the premises.

Striking contrasts are seen in effectiveness of administrative control, security of land values, and conditions favoring or inimical to resource and country development, between countries with and those without adequate modern cadastral surveys. The examples in the 20-country factor comparison on the following pages seem to show conclusively a strong advantage of land reform programs utilizing such surveys over those not utilizing them.

The exigencies of actual execution of land reform programs well may preclude taking time for systematic cadastral surveys before land distribution is carried out, as in the case of Iran. But by the same token the experiences of several Latin American countries attest the political impossibility, in their circumstances, of launching meaningful land distribution without prior

surveys. And a closer look at Iran warns that even the dramatic progress in land distribution made there to date can be quickly eroded if surveys do not soon follow to demarcate tracts and enable issuance of firm titles: Extensive land distribution made to Iranian peasants in the 1930s soon reverted to more powerful elements when the recipients were unable to identify and defend particular tracts as those conveyed by their titles.

The lesson of all this, so far as cadastral surveys are concerned, seems to be that it is not enough to write a land title on paper -- the land referred to must be "branded". That is, it must be so marked that it can be readily found and incontrovertibly identified, independent of local familiarity.

Only this degree of identification and linkage between land and owner affords the securities essential for optimum resource development and use which are, or should be, the foundation objectives of land reform.

In the following pages the term "cadastral surveys" is used in the limited land-identifying sense defined in my first sentence, and does not include taxation inventories and other recognized uses of the term.

## II. CHART: COUNTRY COMPARISONS

<u>Land Information Factors</u>	<u>Yugoslavia</u>	<u>Hungary</u>
1. Pre-reform status of cadastral surveys	Surveys out-dated, incomplete, or non-existent	Surveys accurate and complete
2. Pre-reform status of land titles and possession	Titles generally secure in northern parts but not in south	Titles and possession presumed to have been generally secure
3. Circumstances of land ownership transfer under reform	Land ownership nationalized, then partially reverted to private title	Land ownership nationalized
4. Land available for ownership transfer	Developed lands under tenancy or self-use	Developed lands under tenancy or self-use
5. Reform program use of cadastral surveys	New surveys made for establishing collective farms, and for creating new private holdings	Existing surveys apparently met the needs of collectivisation
6. Reform program basis for transfers of land title	Previous private titles expunged by State; new titles based on central authority	Previous private titles expunged by State
7. Rate of reform land distribution	Distribution delayed for state policy reasons rather than for lack of surveys	Land not distributed
8. Rate of reform land title issuance	Title issuance presumably concurrent with creation of private holdings	Private land title not issued
9. Post-reform status of cadastral surveys	Surveys completed as needed	Not relevant
10. Post-reform accuracy and security of land titles	Presumed fully accurate, and secure if policy toward private ownership maintained	Not relevant

<u>Algeria</u>	<u>Tunisia</u>	<u>Egypt</u>
Surveys accurate and complete	Inferentially it appears no cadastral survey existed before reform	Surveys essentially accurate and complete
Titles and possession presumed to have been generally secure	Titles presumably based on community consensus, with usual accompanying insecurities of title and possession	Titles legally secure and defensible
Ownership of former French holdings nationalized, then redistributed under prescribed criteria	Ownership transfers apparently orderly and under prescribed eligibility criteria	Ownership transfers made in orderly fashion under prescribed eligibility criteria
Developed lands formerly owned by French settlers	Developed lands formerly owned by French settlers	Developed lands in large private estates, religious endowments and foreign ownerships; undeveloped state lands
Existing surveys used to identify, possess, and redistribute former French holdings	New cadastral surveys used as basis for new land titles, and for registration of small holdings into collective units	Existing surveys used to identify, possess and redistribute affected holdings
Previous private titles nationalized by State, and new titles issued	Transfers based on evidence of new cadastral surveys	Transfers based on engineeringly established ownership demarcations
Land distribution paced by capacity of new government to establish administrative organization; no serious delay	Land distribution paced by capacity of new government to establish administrative organization; no serious delay	Land distribution done very rapidly for each class of land as brought under expropriation
Title issuance presumably kept pace with redistribution of lands	Title issuance has kept pace with redistribution of lands	Most reform title issuance soon after distribution; some lag where previous title not clear
No information on maintenance of surveys by new government	Governmental emphasis on rule by law suggests surveys will be kept up-to-date	Surveys presumed to be kept up-to-date
Titles presumed fully accurate and secure, and possession firm	Titles presumed fully accurate and secure, and possession firm	Titles presumed fully accurate and secure, and possession assured

<u>Land Information Factors</u>	<u>Iraq</u>	<u>Iran</u>
1. Pre-reform status of cadastral surveys	Incomplete	Surveys incomplete and not fully reliable
2. Pre-reform status of land titles and possession	Titles vulnerable to legal attack; possession subject to encroachment and/or usurpation	Titles vulnerable to legal attack; possession subject to encroachment or usurpation
3. Circumstances of land ownership transfer under reform	Legislative provision for legal and orderly transfer, but chaotic administration	Ownership transfer made in orderly fashion under prescribed eligibility criteria
4. Land available for ownership transfer	Developed and idle lands in large private estates and State domains	Developed lands under tenancy in large, medium and small private estates; endowed and state lands
5. Reform program use of cadastral surveys	Pre-reform surveys presumably used; new surveys proceeding toward completion	No cadastral surveys made for land distribution purposes
6. Reform program basis for transfers of land titles	Transfers based on a mixture of community consensus and new cadastral survey information	Transfers based on creation of new community land registers under community consensus
7. Rate of reform land distribution	Many and prolonged delays in distribution, partly from lack of cadastral information, and partly from reversals of government policy	Land distribution done very rapidly on large estates and state lands; more slowly on endowments and smaller estates
8. Rate of reform land title issuance	Very irregular, but generally much delayed	Provisional titles issued concurrently with land distribution
9. Post-reform status of cadastral surveys	Surveys and distribution still in process	New cadastral surveys thought to be proceeding toward systematic completion
10. Post-reform accuracy and security of land titles	Titles unclear and vulnerable to legal contest or <u>de facto</u> disregard until supported by surveys	Titles vulnerable to legal contest or disregard and land possession subject to encroachment

<u>India</u>	<u>S. Vietnam</u>	<u>Philippines</u>
Cadastral surveys absent	Partial surveys from former French regime	Partial surveys, done over the 1901-63 period, plus continuing surveys since
Titles vulnerable to legal attack; possession subject to encroachment or usurpation	Apparently a fair degree of security as between indigenous claimants, but subject to French expropriation in selected areas	Apparently good security where title supported by cadastral survey, but many squatters on unsurveyed lands
Ownership transfer made in orderly fashion under prescribed eligibility criteria	Ownership transfers now proceeding under prescribed criteria, subject to uncertainties of war	Orderly ownership transfer under prescribed criteria
Developed lands under tenancy, and some idle lands, in large private estates	Developed lands under tenancy in large private estates, formerly used lands abandoned in the war, and new lands subject to development	Developed lands under tenancy in large estates, plus undeveloped public lands of lower quality
No cadastral surveys made for land distribution purposes	New surveys being made as needed ahead of distribution	Existing and ongoing surveys being used for distribution
Transfers based on community land registers, as reviewed and corrected	Transfers presumably based on new land registers tied to the cadastral surveys	Transfers based on engineeringly established ownership demarkation
Extremely tedious and prolonged distribution of land	Distribution slowed, interrupted and prolonged by war conditions	Distribution held to insignificant rate by shortage of funds and technical staff, caused by opposition
Title issuance in pace with land distribution	Title issuance presumed to be in pace with land distribution	Title issuance in pace with land distribution
Apparently no future use of cadastral surveys intended as part of reform	Both reform and surveys still in process	Both reform and surveys still in process
Titles vulnerable to legal contest or disregard, and land possession subject to encroachment	Titles presumably sound if not disturbed by war conditions; possession same	Titles and possession presumed generally firm

<u>Land Information Factors</u>	<u>Taiwan</u>	<u>S. Korea</u>
1. Pre-reform status of cadastral surveys	Surveys complete and accurate	Surveys complete and accurate
2. Pre-reform status of land titles and possession	Titles legally secure and defensible	Titles registered but subject to set-aside by Japanese without adequate compensation; possession precarious
3. Circumstances of land ownership transfer under reform	Orderly ownership transfer under prescribed criteria	Orderly transfer under prescribed criteria but subject to war disturbance
4. Land available for ownership transfer	Developed lands under tenancy in over-ceiling farms; expropriated Japanese estates; State domains	Developed lands under tenancy in over-ceiling (3 ha) farms; expropriated Japanese estates
5. Reform program use of cadastral surveys	Existing surveys brought up-to-date as needed to fully identify and measure distributed lands	Existing surveys relied on for all distributions
6. Reform program basis for transfers of land titles	Transfers based on engineeringly established ownership demarkation	Transfers based on engineeringly established ownership demarkations with boundary adjustments to fit new land allocations
7. Rate of reform land distribution	Distribution done very rapidly by large force of well trained and supervised workers	Distribution irregular because of war conditions
8. Rate of reform land title issuance	Title issuance concurrent with land distribution	Title issuance in pace with land distribution
9. Post-reform status of cadastral surveys	Surveys being kept up-to-date in land rearrangement and development programs	Surveys being maintained where ownerships subdivided or lands rearranged or taken for non-farm uses
10. Post-reform accuracy and security of land titles	Titles secure and possession assured	Titles secure and possession assured

<u>Japan</u>	<u>Mexico</u>	<u>Colombia</u>
Surveys complete and accurate	Surveys unsure and undetailed in early years at least	Surveys fragmentary
Titles legally secure and defensible	Secure titles on large estates but much encroachment of large upon small because of boundary vagaries	Systematic land records lacking; titles vague
Orderly ownership transfer under prescribed criteria	Some early peasant invasion of large estates but later transfers generally orderly	Meager number of pre-arranged transfers of private land; mostly confirmation of titles to squatters on public land
Developed lands under tenancy in over-ceiling farms	Developed lands under tenancy in large estates, plus some undeveloped lands	Much idle private land but distribution effectively resisted; much undeveloped public land but remotely situated
Existing surveys brought up-to-date as needed to fully identify and measure distributed lands	Surveys used to the extent available and sufficient	Minimum, if any, use of cadastral surveys for land reform
Transfers based on engineeringly established ownership demarkations	Transfers based on national land register which is well maintained	Transfers presumably based on some sort of national land register
Distribution done very rapidly by large force of well trained and supervised workers	Distribution extended over several decades and still proceeding to some degree	Distribution insignificant
Title issuance in pace with land distribution	Title issuance presumably in pace with land distribution	Title issuance presumably in pace with distribution
Surveys presumably being maintained to cover ownership subdivisions land rearrangement and non-farm uses	Surveys presumably being maintained and extended as needed	Not applicable
Titles secure and possession assured	Titles presumed to be secure and possession generally firm	Titles and possession security untested

<u>Land Information Factors</u>	<u>Venezuela</u>	<u>Ecuador</u>
1. Pre-reform status of cadastral surveys	Surveys far inadequate	Surveys fragmentary
2. Pre-reform status of land titles and possession	Minority of farmers held clear title; 50% had no title	Titles and possession based on community consensus plus property right guarantees of political and constitutional charters
3. Circumstances of land ownership transfer under reform	Much approving of land claims without previous study, but generally in legal channels	No reported progress in land ownership transfers
4. Land available for ownership transfer	About 25% of developed land is under tenancy; large areas of public land considered suitable for cultivation at moderate development cost	Land availability inventory authorized in 1964; no report cited
5. Reform program use of cadastral surveys	No reported use of cadastral surveys for land reform, though provided for in 1960	Systematic cadastral surveys planned but not yet executed
6. Reform program basis for transfers of land titles	Apparently based on central record system established by land reform agency	No information stated as to intended basis for transfer of land titles
7. Rate of reform land distribution	Initially rapid but later slowed by political change and budget restrictions	Land distribution does not appear to be under way as yet
8. Rate of reform land title issuance	Slow in relation to need; about 25% of land distribution rate	Title issuance not yet reported
9. Post-reform status of cadastral surveys	Not applicable	Not applicable
10. Post-reform accuracy and security of land titles	Titles and possession presumably secure, as agricultural profitability declining relative to other enterprise areas	Legal provisions for title security set up but no report of how effective in practice

BrazilBolivia

Surveys cover only a small portion of total lands

Surveys lacking

Titles and possession insecure with many disputes; many legal defects

Titles and possession dependent on community consensus

No reported progress on land distribution

Uncertain amount of land distribution under central government control

Much idle or under-used lands in private estates; large areas of undeveloped public land

Some lands under tenancy on large estates; undeveloped or under-used land both public and private

Occasional spot surveys made to settle community disputes; no systematic surveys for reform purposes

Country-wide surveys by army engineers

Land ownerships recorded in a Public Register (national)

Local land ownership registers based on surveys plus community consensus

Rate of land distribution insignificant in terms of total need

No apparent real progress in land distribution

Title issuance presumably in pace with land distribution

Title issuance presumably in pace with land distribution

Not applicable

Surveys done by army engineers included many mistakes and abuses; record basis worsened

Title so uncertain that title insurance unavailable; possession similarly insecure

"Only adjustments are continual disputes." Agric. Bank agents do not attend at development projects because "the titles in no way conform to reality "

### III. SOUTH VIETNAM PILOT STUDY

In its report on a pilot study of cadastral survey and land titling procedures suitable for speeding the land reform program in South Vietnam, the Engineer Agency For Resources Inventories (EARI), Department of the Army, USA, found that:<sup>3/</sup>

"A. Land reform is dependent upon an ability to administer lands; in fact, it superimposes additional demands on the land administration system.

"B. Past efforts at land reform in Vietnam have been frustrated by a lack of technically trained personnel at the province and village level, by insecurity in the countryside and by insufficient funding of the land reform effort. The most significant of these deterrants is the lack of trained personnel.

"C. Research and development efforts by the Corps of Engineers in An Giang Province have resulted in the modification of basic photographic practices into a system which allows the GVN to eliminate the need for highly trained personnel at the local level, reduces the security problems associated with land surveying in the field, and minimizes the program costs."

The procedures described in this report are illustrative of techniques widely developed and proved in recent years by a number of U.S. agencies working in this field. The Engineering Division, Bureau of Land Management,

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<sup>3/</sup> Land Reform, Vietnam: A Program to Speed Land Distribution, Report to Dept. of State, Agency for International Development, March 1969, page vi.

Department of the Interior, has combined high-resolution aerial photography and air personnel transport with telemetric, electronic and other high-speed-and-accuracy distance measuring equipment to bring the rugged mountain areas of the Western States and the vast wilderness reaches of Alaska within reach of rapid land boundary determination and monumentation. The Forest Service and Soil Conservation Service of the Department of Agriculture have developed rapid and accurate aerial mapping methods for their programs of forest resource management, erosion control and farm planning, all requiring close determination of land ownership, vegetative type, soil type, and other surface boundaries.

The most significant findings of the EARI study for consideration in survey programs needed for land reform were that 1) the work saving by the new method, as compared with traditional ground instrument survey party methods, was more than 100 to 1; b) total costs were about \$2.32 per hectare, with prospects that experienced crews could cut this to under \$2.00; and c) if sufficient funds are available to forego the cost savings of training and using local personnel for the more technical operations, cadastral surveys of entire countries now can be carried out in a relatively few years. Even with the training of local personnel to conduct and maintain these surveys, the study estimated that all the 22 Delta provinces of South Vietnam could be surveyed in ten years and the rest of the country in a few more years. This would result in issuance of state-guaranteed land titles to nearly 2,000,000 farmers. By contrast, "only 15,000 legal titles have reached the owners in 15 years of land reform effort in spite of expenditures which approach \$15,000,000."  
(p. 4)

"Fifty to 100 years and not less than \$100,000,000 would be needed for the Directorate General of Land Affairs to comply with the legal requirements for cadastral surveys utilizing ground survey methods ... Photogrammetry constitutes a workable alternative to ground surveys. Utilizing photogrammetry, 10 years is sufficient time for the DGLA to reconstruct cadastral records for all portions of Vietnam where they once existed, [1939 villages] and to start construction of original records for the remainder of the country. [843 villages]. It should be possible to hold the total cost below the level of \$10,000,000." (p. 8)

Principal operational aspects and standards of performance under the EARI study, of interest for other countries, were:

1. Aerial photo plats of suitable scale were used for direct inscription of property boundaries.
2. Planimeter calculations were used to determine property areas.
3. Boundary distances were determined to an accuracy of 1 foot per 1000 feet.
4. Resulting land records will provide the basis for indisputable titles, under government guarantee (Torrens system).
5. Photography flown at 1/40,000 was used for orientation to primary geodetic triangulation points already fixed.
6. Photography flown at 1/10,000 was used to compose the mosaics (conformed to the 1/40,000 orientation photos), from which enlargements of 1 to 5,000 or larger were made for direct platting of properties.
7. Experience showed that the 1/40,000 and 1/10,000 photography should both be flown in close sequence to avoid seasonal changes in

vegetation, water distribution, etc., which make the identification of a given landmark on the two different photos difficult.

8. To establish in-country capability to conduct and maintain surveys of this kind, two types of training are needed:

a. Field operations training for data collection, photo-identification and planetable surveying - 2 months.

b. Engineering, photographic and electronic techniques:

Geodesy  
Photogrammetry  
Photomosaics  
Photography  
Reproduction  
Electronic computers  
Systems analysis



9 to 18 months if already  
basically trained in  
engineering or mathematics.