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Land Tenure Administration in the Context of Hemispheric Trade Integration in the Americas

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Trade integration will have a negative fiscal effect on customs revenue, which accounts for up to half of all public revenue in many Latin American and Caribbean countries. In the face of huge public deficits, governments will be looking to cut costs while increasing revenues from other sources. With the growing need for public investment in the social sector, particularly in basic education and health care at the local level, taxation of property is becoming increasingly important as a future revenue producer. However, taxation of land implies accurate, agile, up-to-date data on parcel size, value and ownership. This basic informatic infrastructure is not readily available in most of Latin America.

This article discusses the present context for reconsideration of land tenure administration in the light of the trend in the Latin American region towards market integration. The Global Positioning System (GPS), first used in Albania, and now in places like Trinidad and Costa Rica, is paving the way for dramatically reduced costs, greater speed, and broader opportunities for private sector participation. When combined with moves towards decentralisation and greater transparency, these efforts will play a dramatic role in the future economic recovery of the region, while laying the foundation for regional economic integration together with enhanced fiscal revenues from property taxation. Combining GPS with orthophoto maps also stimulates greater community participation in mapping, giving land administration more legitimacy in the view of the public. In this way, some of the benefits of both private sector involvement and rural people's participation will be possible. Trade integration will not mean sacrificing the social sector.

In the context of trade integration land tenure administration is becoming critical for a number of reasons. First, governments will need to increase their capacity to generate revenue via land taxation. Today, most governments in the region rely on customs revenue to finance between 25% (as in Argentina and Peru) and 40% (as in Belize and the Dominican Republic) of their national budgets. Trade integration implies reduction or elimination of trade barriers, and with it customs revenue. Property taxation is a logical substitute. Secondly,

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economic integration implies massive investment flows. However, investments require appropriate informatic infrastructure. Thus, governments will pursue reforms of tenure administration with a view to providing adequate security for investors. Thirdly, trade integration should be an inclusive process. Given the new technological realities, there is little excuse today for not including all property holders in the formal property system. Finally, environmental and equity concerns reinforce market integration policies in pushing for reform in the management of land records.

Successful regional approaches to registration and cadastral reform

Registration and cadastral reform are often held to be means of addressing deficit reductions and allowing for increased investment in the social sector. More specifically, governments generally seek to promote:

- transactions transparency: the rule of law requires that property transactions be carried out in a transparent system free from corruption. The market requires transparency to get the prices right.
- private sector participation in the provision of survey services which are traditionally public sector activities. There is nothing more basic to the development process than participation (Agency for International Development, 1994:15).
- decentralisation: to empower local government and provide local access to public information.
- reduced transactions costs through new technologies: to allow the poor, women and indigenous groups to participate in the registration process. Furthermore, greater efficiency in government, with leaner, smaller budgets, while at the same time demanding greater services, means that the Registry must rethink its approach to information management.

Where are we today? Common regional issues

Currently, only the more economically sophisticated can manipulate the Byzantine registration and cadastral systems frequently found in the Latin American region. Information is power, and the current system offers key economic information only to the few. When this is combined with market liberalisation, economic growth might be expected to be even more exclusionary if the registration issue is not confronted. As Guyanese attorney Leon Rockcliffe

asserts: 'The registry is the basis of social stability, beyond mere economic stability. [Without addressing registry reform] the country is flirting with anarchy. People with economic power can run through the system when things are in disarray' (Stewart and Hendrix, 1995: 7). While even the more sophisticated have difficulty in manipulating the registry system because of lack of administrative and technological efficiency, the poor are often entirely excluded.

Inefficiencies and lack of comprehensiveness and transparency in registries and cadastres mean that the poor usually do not have access to what is for them perhaps one of the most important institutions of the justice system. *The poor are effectively denied the benefits of citizenship in democratic society.* Similarly, they escape the responsibility of citizenship, i.e., property taxation. In other words, responsibility of citizenship means payment of taxes.

Other weaknesses of the current system include:

- lack of information about other experiences in project design: what has worked elsewhere and what has failed. Hence, there is a continuous need to 'reinvent the wheel', as is evident in Venezuela's current programme.
- extremely weak cost-benefit analysis, as in proposals for modernisation put forward in Venezuela, El Salvador or Ecuador.
- slow, expensive processes that ignore the new technologies available to reduce transactions costs, as in Guatemala, Guyana, Ecuador or the Dominican Republic.
- land administration systems that are generally highly centralised, as in Guatemala, Costa Rica and Panama.
- lack of conceptualisation of value-added projects, despite having very important and highly valuable information. Value-added products have the potential to contribute vast profits to government far beyond its investment in the registry. Failure to take these products into consideration means lost income for cash-strapped regional governments. This is true in Peru, Ecuador, Bolivia, Guyana, Nicaragua, Honduras and other administrations.
- little participation by the private sector, as in Peru, Nicaragua, the Dominican Republic and Ecuador.
- lack of capital for investing in the system (e.g., Peru, Venezuela, Ecuador, Honduras), although the system could be designed to be self-financing in the longer term, and indeed could generate massive amounts of money for local and central government.

- perceived insecurity of ownership (as in Nicaragua, Guatemala, Venezuela) or at least confusion of ownership (e.g., Peru, the Dominican Republic, Guyana, Bolivia).
- demands on the part of indigenous groups and small farmers for titles: the public sector does not respond to the demand in an efficient, responsible, timely manner, (e.g., Ecuador, Bolivia, Panama, Nicaragua, Peru and Mexico).
- competitiveness: as the developed world moves from the industrial to the information age, the Third World will fall ever further behind. Countries that do not embark on information management strategies will continue to be uncompetitive and will never 'graduate' from being economies dependent on foreign aid.

A way forward: common approaches to land records management

Cadastral surveying

Given the importance of land records, how can new methods and technologies help in the measurement of parcels and the determination of parcel size? In the past, traditional survey methods were all that were available. Nevertheless, Global Positioning Systems (GPS) are now frequently being considered. In the 1980s, surveyors began to use GPS, which was found to reduce the costs of surveying, the most expensive aspect of land titling.

GPS consists of 24 satellites: 21 operational satellites and three spares. The satellites are placed in a high altitude, geostationary orbit, and are maintained by the US Department of Defense. They can be used worldwide. Radio signals are sent out continuously from the satellites. Anyone using a GPS receiver on the ground can read these twenty-four hours a day. In its most elementary form, the GPS receiver calculates its position based on the equation: Distance = Velocity X Time. Both the satellite and the receiver have very accurate, synchronised, internal clocks. To calculate an accurate co-ordinate, four satellites should be read by the receiver. The co-ordinate is then calculated using triangulation, based on these readings.

Options and in-field variation

Until a few years ago, geodetic GPS, accurate to a less than a centimetre, was expensive, requiring up to half an hour to fix a single point using two base stations and a rover. Single-receiver GPS, without any base station, could fix a point in seconds, but allowed margins of error of up to 100 metres. This was excellent for navigation, but useless for mapping. In March 1994, the Land Tenure Center at the University of Wisconsin experimented with using differential GPS to carry out parcel mapping. It was found that, using high quality GPS receivers, it is possible to obtain metre-level accuracy in just 30 seconds per point (Barnes et al., 1995: 111–20). Differential GPS uses only one base station and one rover unit, which provided a quick, inexpensive alternative for GPS survey. In all three categories, never before have the costs been lower or the benefits higher. Indeed, it is possible that we are coming to a point where the instruments are so precise that the primary errors in accuracy now come from errors in relocating the exact position at which the original points were taken in non-monumented¹ situations (Leininger, 1996: 17–18).

Before jumping on the GPS wagon, we should first ask what are developing countries' survey needs. Grenville Barnes notes that, first, surveying should be affordable and efficient. Any new approach must perform better than traditional methods, which are usually considered expensive. In the 1980s, survey costs in Latin America and the Caribbean were about US\$40 to US\$100 per hectare, or US\$50 to US\$120 per parcel. These costs are seen in Table 1. Efficiency also means short occupation times for defining a single point. We should not wait 10 minutes at a point. Instead, 30 to 60 seconds would be ideal, depending on parcel size and accessibility. We may decide to spend more time if parcels take a long time to reach on the ground (Barnes, 1995). New technologies help achieve these goals at a much lower cost, as is seen in Table 1 in the cases of Nicaragua and Albania.

Potential revenue from land taxation dwarfs the costs of reforming the administration of land tenure. For example, in 1994 and 1995, the Municipality of Buenos Aires initiated a new fiscal cadastre. In those first two years of operation, it generated approximately US\$1,000m. in revenue each year and further increases were expected in the third year. La Paz is having a similar experience; people actually wait in long queues to pay their property taxes under the new system there. Land tax programmes are just beginning to generate substantial revenues today in Colombia (urban areas), Chile (urban areas), San Salvador, Managua, Guatemala City and other places. Of these, perhaps only Chile had prior positive experience with land taxation.

1. In US law a monument is an object fixed permanently in the soil and used to ascertain the location of a tract or boundary.

Table 1
Comparison of the 'Wisconsin Model' in
Nicaragua/Albania with traditional land regularisation models

<i>Jurisdiction</i>	<i>Timeframe</i>	<i>No. of parcels</i>	<i>Cost per parcel for survey</i>	<i>Cost per parcel for inscription</i>
Nicaragua	May/96 to present	approx. 5,000 to Sept/96	US\$12	Data not available
Albania	Nov/94 to Jul/95 (10 months)	approx. 72,000	US\$3-5	US\$1
Honduras	Sept/83 to Oct/87 (49 months)	94,028	US\$120	US\$35.20
Ecuador	Apr/87 to Oct/87 (6 months)	approx. 74,972	US\$50	US\$167
St Lucia	Dec/84 to Apr/87 (29 months)	approx. 52,000	US\$96	US\$39

Note: Prices include labour, transportation, per diem allowances, and other variables in addition to GPS costs. This may affect the absolute costs. However, GPS will dramatically reduce costs, and these figures are illustrative of what might be expected.

Sources: For Nicaragua: Strasma, 1996. For Albania: Stanfield, 1995. For Honduras, Ecuador and St. Lucia: Barnes, 1990.

Secondly, surveying should permit long baselines. Traditional approaches require a line of sight for the survey. This means not only short distances, but also clearing the land. Ideally, baselines should extend to at least 100 kilometres. Such a distance would reduce costs, eliminating the need to densify and maintain additional control points (Barnes, 1995).

Thirdly, parcels should fit together into a national grid, convertible to the worldwide network. This requires georeferencing the parcels, so that one parcel's boundary description corresponds with its neighbour's description of the same boundary. Historically, parcel boundaries were described as distances and angles, or metes and bounds, without corresponding to other boundary descriptions. This produced gaps and overlaps in parcels, and consequently a great deal of insecurity. This can be eliminated through the use of co-ordinates that can provide absolute positioning using geodetic control (Barnes, 1995).

Fourthly, developing economies need a realistic level of accuracy. This is perhaps the most difficult aspect of project design, since it implies a cost-benefit analysis. Designers should question how accurate the clients need the

measurements to be. Historically, the technology dictated the requirements: surveyors simply provided what was best. Today, that approach is too expensive. As an alternative, a user-needs approach has been put forward: what does the client need? Unfortunately, clients (governments or donors) seldom have criteria for making such decisions. Perhaps one way to approach this depends on the co-ordinates themselves. Measurements should be at least good enough to: relocate monuments or even relocate missing points or co-ordinates; replace co-ordinates; or describe points. Differential GPS is usually sufficient for these purposes. However, a final decision may depend on the size and value of the parcel, the capability of getting better measurements, neighbourhood relationships, and other factors (Barnes, 1995).

Fifthly, emerging markets need a realistic level of technology. We cannot advocate a technology which is so advanced that it requires highly trained people whom the country does not have. Governments should consider the technology level, the existing skill base and the training requirements. In this regard, GPS technology is very easy to use and is adaptable to developing country environments (Barnes, 1995).

GPS methodology for producing maps for titling

With a geodetic GPS, a minimum of two base stations are used as control points. Independent 'rover' units managed by survey teams then take measurements of individual parcels. Team membership varies by country, but often consists of a GPS operator, a data collector who knows the boundaries, and a sketchmaster (Barnes, 1995).

Controlled tests in Albania and at the University of Florida show that differential GPS with very precise receivers can yield accuracy to below a metre with a baseline of up to 135 kilometres. Accurate readings can be produced in 15 seconds. In Albania, in terms of productivity, traditional methods can survey 10 hectares per day, or 6 to 12 parcels. GPS was at least three times more productive, allowing for 37 hectares per day, or 76 parcels. Furthermore, GPS cut the adjudication time even more because of digitalisation (Barnes, 1995).

In March 1995, a workshop was held at the University of Wisconsin to assess the use of Geographic Information Systems, GPS and other technologies in various settings (Gage et al., 1995). In August 1995, a GPS workshop was held in Port of Spain, Trinidad and Tobago, to display the 'Albania Model' with new GPS technology along with land administration practices to governments of the English-speaking Caribbean. Based on that workshop and other consultations, the Governments of Trinidad and Tobago and Belize announced plans to take advantage of the new approaches. Similar initiatives are being considered in Jamaica, Guyana, Barbados, the Dominican Republic, Panama, Nicaragua, El Salvador and elsewhere.

Inclusion of orthophotos to provide greater participation

World Bank projects in Paraguay and Brazil have shown that combining the use of GPS with orthophotos provides for greater participation by the community. Because a client or smallholder can delineate the boundaries of his property on an orthophoto and then confirm those boundaries with the demarcation and delineation teams, he/she can participate directly in the process. This produces two immediate benefits. First, and most important, institutions that address land, cadastral or tenure concerns have historically suffered from low institutional confidence: often they were associated with corruption, inefficiency or poor quality work. To rebuild investor confidence and create confidence among beneficiaries, it is important that they participate in the process and see that what is being done is accurate, transparent and honest. Secondly, orthophotos may speed up the process. At first sight, the additional cost of orthophotos along with a slower process might be regarded as a backward step. However, to the extent that the community can define boundaries in advance on orthophotos, the demarcation moves more swiftly. This in fact was the original premise behind the 'Land Adjudication' and 'Land Courts' set up by the British in their various colonies in the Caribbean. Combining this traditional, inclusionary process with new technologies can speed up the process, while, more importantly, generating institutional confidence and trust. To the extent that development assistance is concerned with creating investment, employment and the requisite conditions for private sector initiative, nowhere is restoration of confidence in public institutions more important than in land administration. Finally, orthophotos also allow for later monitoring and evaluation efforts, for example, of change in land use or cover, which facilitate data integration and the creation of a multi-purpose land information system.

Private sector participation

One option mapping agencies may consider is the establishment of a permanent GPS base station at a central location or at various locations. This base could be set to download the information needed for differential GPS. If private surveyors invest in GPS receivers that can be used as rovers, they can then buy the information needed to correct differentially the position locations that they collect with their rovers. This would make GPS surveying much more accessible to the average surveyor, and could also speed up the surveying process (and potentially reduce costs) in the country as a whole. It would also allow the mapping agency to recover some of the costs of the GPS base station. In this context, initiatives in land administration should include some assessment of retraining needs, as appropriate.

Other opportunities for private sector collaboration within the land management system include: organisational consulting; training; capacity building; storage of maps, photos and data; and data conversion, among other services.

Recent US government policy shifts

The Clinton Administration's Office of Science and Technology Policy (OSTP) recently announced a major policy shift on GPS technology. Historically, the US Department of Defense (DoD) operated the global positioning system, and downgraded the satellite signals used for civilian purposes. The new OSTP policy makes clear that this practice is to be discontinued. The new policy provides stability and security, especially in international markets, to allow more rapid incorporation of the technology. In addition, the White House is pledged to support commercial GPS markets, and the Commerce and State Departments have been charged with stimulating commercial interest in GPS technology (*GIS World*, June 1996).

Land administration has become an important business and export for the US, as the economy shifts toward the information age. The government, through the DoD, has spent billions of dollars to develop the GPS. With the new White House policy, in addition to other technology trends, firms like ESRI, Intergraph, Plan Graphics, UGC Consulting, American Cadastre and others stand to benefit from the growth in export potential, provided that land administration projects in the region are designed to take advantage of the reduced costs and improved efficiency that US technology brings.

The US is also concerned about the intellectual property interests in attributing information gathered from land administration activities. If public access to information policy is to be promoted in the region, the international community must ensure that systems are designed to vest the various governments with control over the attributable information, as opposed to individual property owners. Access to information on such an important factor of production as land is critical for market economies.

Conclusions and recommendations

Finance Ministries of the various individual governments in the region need to assess the extent to which a Free Trade Area of the Americas (FTAA) will reduce government revenue. Next, they must assess what cuts can be made in existing programmes, and what revenue deficits will need to be replaced. The revenue potential from property taxation should then be closely examined. Once a decision has been taken to proceed with a property taxation strategy, the

technological issues of GPS/GIS can be addressed in the context of registration and cadastral reform.

Governments will look to increase the efficiency of their land administration programmes. Today there is a great opportunity to leapfrog the more advanced countries and implement the latest First World technologies to reduce costs dramatically, to save scarce development dollars, and to improve data quality. The most direct impact will be in the form of more public revenue for programmes such as in education and health care. However, reform will also have a direct impact on land administration itself, reorganising and streamlining mapping and titling agencies and making them more client-driven. They will also be better able to absorb budget cuts, while generating more revenue.

Land administration reform will have many other parallel benefits, besides the generation of fiscal revenue for education and health programmes. Investors will need accurate and honest land administration as a prerequisite for the massive regional investment expected from the FTAA, which in turn is a prerequisite for the hoped-for job creation for the middle classes. Environmental initiatives, democratisation efforts and anti-corruption campaigns will also benefit, making those countries that pursue this policy the most competitive in the new international market.

Historically, land administration projects have proved to be financial black holes for donors, which pumped in millions and saw little in return. However, we no longer look for agrarian reform or increased agricultural productivity as the test of the 'success' of initiatives. Furthermore, we have advanced far beyond the old, traditional survey and communications methods. In short, land administration efforts today can yield many more benefits at a fraction of the cost: the region should discard yesterday's notions of 'land titling' and think much more broadly about tomorrow's possibilities.

The use of GPS will involve overcoming a number of hurdles. (a) There has been a general lack of experience among developing world surveyors with any system other than traditional surveying equipment; (b) there is sometimes a 'fear' about using new GPS equipment; (c) there is sometimes reluctance to keep records and evaluate the costs associated with terrestrial surveying techniques; and (d) access to data is sometimes difficult (Moyer, 1995). To address these concerns, governments should develop strategic plans for using the new technologies and methods and for retraining employees. As costs plummet, the latest technology is now available to all developing countries, even the poorest. Similarly, as the GPS methodology is so simple, North American experience will be readily applicable in Latin America and the Caribbean.

Private sector competitiveness, sub-metre accuracy, and new low-cost software, hardware and scanners are translating into substantial savings and efficiencies through their integration and through the creation of multi-purpose land information systems.

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