

# **Towards Effective Pro-Poor Tools for Land Administration in Sub-Saharan Africa**

**Paul VAN ASPEREN, Jaap ZEVENBERGEN, The Netherlands**

**Key words:** land administration, tenure security, pro-poor, tenure reform

## **SUMMARY**

The implementation of 'Western' land administration systems (the classical approach) often failed in Sub-Saharan Africa for several reasons. And when (partly) successful, it did not benefit the poor. Recently more attention is given to the inclusion of customary tenure in land administration. This is referred to as the innovative approach, which should be able to protect the customary rights in a land administration program.

Recent land policy reforms in Sub-Saharan Africa implemented innovative tools in order to, amongst others, improve tenure security for the poor. Tools are for example occupancy licenses, customary leases, certificates, etc. In this way the continuum of land rights as presented by UN-Habitat can be recorded. The developments in Zambia, Uganda and Mozambique are described with respect to the continuum of rights. The more classic approach in Zambia (conversion of customary tenure into state tenure) and the more innovative approaches in Uganda (certificates) and Mozambique (community land registration and certificates) are described.

The question arises how effective these tools are. In Zambia, registration of customary lands often leads to denial of other ('secondary') customary rights. In Uganda, no certificates have been issued up till now, while the Land Act has been in force since 1998. In Mozambique certificates are successfully issued, however it is still questionable if the innovative tools have been fully imbedded in society. A tendency is observed that innovative tools are seen as an intermediate solution, the main target to be full title registration (for example in Uganda). However, prospective certificate holders already experience increased tenure security (Mozambique).

The paper describes the preconditions to be met before any of the innovative tools can be implemented successfully. Amongst them are costs, legal consequences, pro-poor approach, institutional capacity, implementation (systematic or ad-hoc), etc. Different approaches of certification and titling, depending on the characteristics of the areas involved, are proposed. The approaches are linked to development levels and market forces. If those are unchanged in an area, there will be no change needed to reach another level of land registration.

# **Towards Effective Pro-Poor Tools for Land Administration in Sub-Saharan Africa**

**Paul VAN ASPEREN, Jaap ZEVENBERGEN, The Netherlands**

## **1. INTRODUCTION**

Land administration is seen as one of the key items to contribute to economic development. However, as is published many times (for example Van der Molen, 2005), the classical implementation of rigorous titling has not proven to be successful. In most reported cases, the poor didn't benefit at all. When implemented usually the well informed, the elite benefited from the land administration programs. Several contributors advocate for land administration systems, which are based on local circumstances and institutions. This paper reviews existing tools for such a system.

The key assumption is that security of tenure is required to make land contribute to economic development. When right holders are insecure, they tend to invest less in land and land improvements. In our view, the primary objective of the pro-poor tools is to increase the tenure security of the right holder.

Tenure security concerns a perception of (un)certainly to have and to keep adequate rights (dimension of extent, breadth, composition or robustness of rights), for an adequate period (dimension of duration) adequately assured/protected (the dimension of assurance or certainty, VVI, 2006).

In many Sub-Saharan countries, a dual tenure system exists: statutory tenure in highly commercial zones (commercial farms, cities) and customary tenure for the rural areas and villagers. Both tenure systems can co-exist, and can provide a sufficient level of tenure security for economic development. However when population pressure and commercialization emerge, the systems tend to affect each other. Introduction of statutory tenure (classic titling) in customary areas is often not the solution, as it might have a negative effect on the tenure security of the customary right holders, often poor people.

In general, the poor are seen as people having an average income of less than 1 US\$ a day. Of course this is a wide definition. In terms of property right holders, one may think of:

- Smallholder farmers and urban dwellers on state land with legal title;
- Smallholder farmers in rural areas, often settled on customary land;
- Urban dwellers in squatter areas and slums;
- New dwellers in peri-urban areas.

This article discusses pro-poor tools for land administration. Such tools have to:

- Protect all land rights the poor are entitled to;
- Be affordable for the poor for first registration and transfer;
- Protect vulnerable groups like women.

## 2. CONTINUUM OF LAND RIGHTS

UN-Habitat (2004) and Payne (2000) describe sets of continuums of land rights and tenure systems. From these lists, we derived the following strict continuum of land rights (with increasing formality or legality):

1. illegal
2. informal
3. customary
4. statutory - leasehold
5. statutory - freehold.

This continuum should be seen as an initial legal description. The legal situation might change due to user action or legal action. User action might be transfer or subdivision of any land right, which may happen in any tenure system. Such user action can be illegal, informal or legal. Legal actions are based on the implementation of new laws or directives, which have an effect on tenure security. One may think of adverse possession or anti-eviction measures. It is evident that these actions will have effects on the applicable rights within the continuum and therefore on the level of tenure security as well. Before modeling the continuum with respect to tenure security, some clarification of the first three categories will be given.

The difference between illegal and informal land rights is the existence of an agreement. In case of an illegal right, there is no agreement at all. In an informal case, some kind of agreement is assumed to exist between right holders. The agreements can be oral or in written form. However such agreements might still lack a legal basis.

Customary rights can be subdivided into the following classes:

- Individual rights;
- Communal ownership;
- Overlapping interests.

The importance of the last two classes (also referred to as secondary rights) should not be underestimated with regard to the livelihood possibilities of poor people, especially in rural areas. These classes are to a certain extent also available within the statutory system like public land and easements.

The continuum of land rights can be seen as an evolutionary system towards the improvement of tenure security. Tenure security can be improved in two ways: improvement within each land right category or movement of right holders to another land rights category with improved security. Of course, it is very important to choose the land rights to be improved. This is a political choice: in case of landlords where squatters have settled on their land, one has the choice to improve the rights of the landlords or of the squatters.

One way of achieving improvement of tenure security within a land right category is through land administration: title holders are given documentary evidence of their right (through the issue of licenses, certificates or titles, fig. 1 a). Of course, the registration should be backed

up by a legal system; however, land administration as such is seen as a tool for increased tenure security.

Movement through the continuum can be achieved through legal tools and/or actions (fig. 1 b), like the implementation of adverse possession or anti-eviction mechanisms.

Movements can be combined, for example to upgrade a lower land right to a higher category, both backed by land administration and legal tools and actions (fig. 1 c). The question arises which (combination of) improvements are most effective.

These questions will be answered by looking at three case studies: Zambia, Uganda and Mozambique. The case studies are restricted to customary tenure in rural areas.

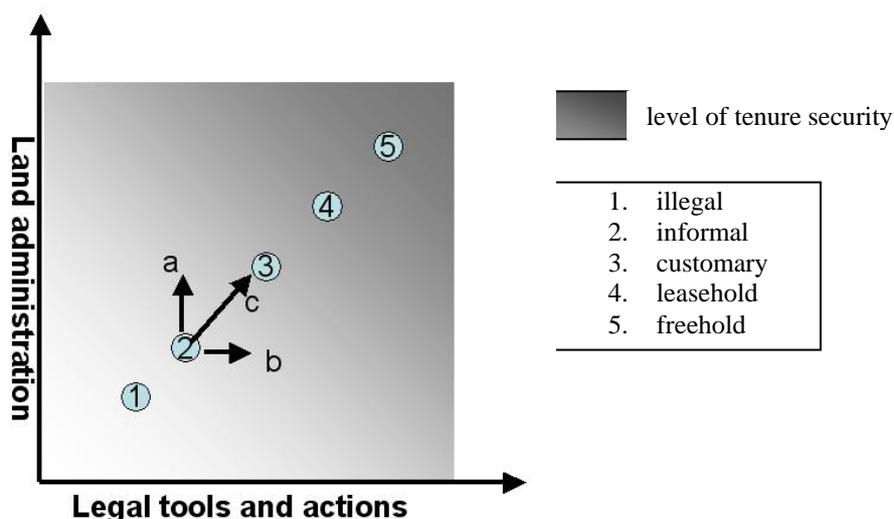


Figure 1 Improvements to increase tenure security

### 3. CASES

The general facts of the case study countries are described in table 1. Table 2 lists the main characteristics on land administration for each country.

|                      | Zambia | Uganda | Mozambique |
|----------------------|--------|--------|------------|
| Population (mln)     | 11.5   | 28.2   | 19.7       |
| Area (sq km x 1000)  | 752    | 236    | 802        |
| Urban population (%) | 36     | 12     | 37         |
| Rural population (%) | 64     | 88     | 63         |
| Poverty-urban (%)    | 56.0   | 12.2   | 62.0       |
| Poverty-rural (%)    | 83.1   | 41.7   | 71.3       |
| Poverty national (%) | 72.9   | 37.7   | 69.4       |

Table 1 General characteristics of countries (sources World Bank -World Development Index 2006, CIA - World Fact Book, 2006)

|   | Zambia         | Uganda                                  | Mozambique                                   |
|---|----------------|---|--|
| <b>Customary coverage</b>                     | 94% of surface | 62% of surface, about 68% of population | 90% of transactions                          |
| <b>Title deed/deed coverage</b>               | unknown        | 700,000 titles                          | Unknown, 6649 accepted, 185 community titles |
| <b>Freehold</b>                               | no             | yes                                     | no   |
| <b>Group/family titles</b>                    | no             | yes                                     | yes  |
| <b>Modern starter/provisional type titles</b> | no             | yes-pilot                               | no   |
| <b>State ownership</b>                        | yes            | yes                                     | yes  |
| <b>Legal legacy</b>                           | British        | British                                 | Portuguese & socialist                       |

**Table 2** Land administration characteristics (Augustinus 2003, Mulolwa 2002, Adams 2003)

### 3.1 Zambia

#### 3.1.1 Legislation

There are two main types of tenure in Zambia, having their foundations in colonial law:

- Customary tenure;
- State Land: registered leases under the Lands and Deeds Registry Act.

In 1995, a new Land Act was implemented. Unlike previous laws, the Act explicitly recognizes customary tenure. However, it seems to have little value. There are no other provisions in the law to improve tenure security within the customary system. The only consequence is that a customary right holder cannot forcibly be removed from his/her land. However, this security is already enjoyed within the customary system to a large extent (Mulolwa 2002).

#### 3.1.2 Conversion of customary tenure

The Act further facilitates the conversion of customary land into leasehold. This is a voluntary procedure and can be applied by any occupant of customary land. This provision is referred to in this paper as conversion of tenure (Mulolwa 2002, Adams 2003).

According to Chileshe (2005), the reason for government to introduce the conversion of tenure was its opinion that customary tenure lacks security of tenure, because the customary rights are not clear. Therefore, the possibility was given for occupants on customary lands to apply for leasehold. However, the following negative effects have been observed:

- The population is not well informed about the possibility of conversion of tenure;
- The procedure is bureaucratic, complicated, expensive;

- Rights to access and cultivate to villagers are deprived.

Some field studies proved the fact that people were not informed about the Land Act (Smith, 2005; Chileshe, 2005). Even some chiefs claim that they were not well informed (Adams, 2003). It is clear that the well informed, usually the elite, have an advantage over the villagers in dealing with land matters.

The procedure to convert to State Land is equivalent to the application for a lease on State Land. Various articles describe the problems related with that procedure. It has to follow strict survey regulations, and there is a backlog in surveying (Mulolwa, 2002).

### 3.1.3 Leasehold in customary areas by outsiders

Evidence from Chileshe (2005) shows that very few customary right holders convert their rights to statutory leasehold. However, outsiders do, as is already regulated through the Circular 1 of 1985 Procedure for Land Alienation, which is still in effect. Outsiders have to follow a similar procedure as customary right holders applying for leasehold.

When leasehold is granted to an applicant, all customary interests cease to exist (both communal and concurrent interests). This is despite the fact that the land will remain in the land category Customary Areas. For the villagers, this will lead to scarcity of land and natural resources as usually large tracts of land are allocated to outsiders. Especially the poor, who benefit from the so-called secondary rights (access to natural resources) on communal land, as it is one of the few ways to get food and necessary items to live.

The draft National Land Policy, which is under debate since 2003, does only address the above-mentioned effects in general terms. One specific objective is to promote equal opportunity for access to land while recognizing customary and leasehold tenures (UN-Habitat 2005).

It is clear that land rights were upgraded. Recent research (Chileshe, 2005) proved that customary tenure in Zambia is secure enough for the villagers, meaning the need for statutory registration shouldn't be driven from the need to increase security of tenure.

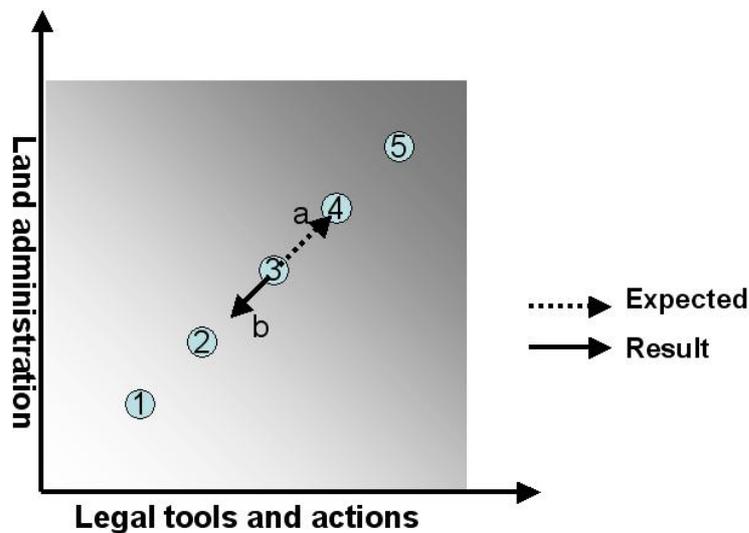


Figure 2 Zambia

In figure 2, the effects of conversion is visualized: conversion of customary tenure, it is a full transformation to leasehold tenure (fig. 2 a). However it has negative effects on existing customary rights (especially secondary rights, fig. 2 b).

### 3.2 Uganda

#### 3.2.1 Legislation

With the enactment of the 1995 Constitution Uganda chose for an innovative change in its land legislation. The choices were re-iterated and detailed with the 1998 Land Act and its implementary regulations.

Uganda chose for having all land vested in the people. This included the land under customary rights, which until then had been considered state land, with the occupants in possession being not more than tenants at suffrage. The new legislation acknowledges that this land belongs to those who possess it according to the applicable customary law. The new legislation also improved the rights of spouses and children with regard to family land. This kind of legal provisions on their own can already increase tenure security for the households involved, as far as they have received knowledge about these legal provisions. With regard to the legal acknowledgement of customary rights, this assumption can be backed up by the results from a baseline survey undertaken in Uganda (Deininger et al, 2006). Thus this can be seen as an example of increasing tenure security through legal action.

#### 3.2.2 Certification

To strengthen the tenure security of these customary owners and highlight the statutory recognition of the rights, the Land Act introduced a system of certification for these rights. A request can be done for a certificate of customary ownership according to the prescribed

procedure, which includes demarcation of the boundaries (not necessarily surveyed) and identifying the names of all customary right holders. Subsequent transfers (e.g. inheritance and sale) have to be recorded with the recorder, a new function given to the sub-county chief. Unfortunately no certificates of customary ownership had been issued by early 2006. Not even in the systematic demarcation pilots that have been launched as part of the Land Sector Strategic Plan (LSSP), approved in 2001, to guide the implementation of the Land Act and related policies.

One of the reasons for not having any certificates issued so far, is the speed with which the Land Act had to be made, not allowing for having the needed institutions and by-laws ready upon promulgation. Another reason was the overstretching of human and financial resources needed to implement the law that called for different land sector institutions at three of the five levels of local government, including 5000 parish land committees and 1000 land recorders (in a later amendment the number of land committees was reduced to 1000). Another reason seems to be the limited faith in the certificates with at least a part of the stakeholders. It is seen by them as a temporary or transitional measure, that ultimately should be upgraded to fully surveyed and registered title under the formal land registration system (issuing Torrens' titles) which applies to the three other legally recognized tenures, being freehold and mailo land (mainly in certain districts) and leasehold land (throughout the country).

Regarding the first pilot where certificates are about to be completed, discussion started whether owners would not be better off with titles. In this discussion there seems little attention for the consequences this would have for the subsequent transfers of the land after registration. The formalities and fees related to titles are much more demanding than those related to certificates. But since there still are no certificates around, many stakeholders seem afraid of them. They were even ignored in the recent preparation of a revision of the Mortgage Act.

Certification can be seen as an example of increasing tenure security through land administration.

### 3.2.3 Conversion

The Land Act allows for the upgrading of customary ownership to titled freehold, and it is not necessary to go through issuing a certificate first. Since the way field survey was done in the first systematic demarcation pilot is good enough for a title, an Aide Memoir (2005) to the Minister was written that describes certification as an intermediate phase, even though the Land Sector Strategic Plan clearly indicated that titling large tracts of the country would be too demanding on both human capacity and financial resources.

The Aide Memoir does include some information on the costs of getting a certificate versus a title, but does not pay any attention to the respective costs of subsequent transfers or mortgaging. It seems that mortgaging of certificates is not taken as a serious option.

The conversion approach is described in LSSP as a sporadic activity and the full costs should be borne by the owner, unlike systematic demarcation for certificates, which will be

subsidized. The sporadic creation of titled land in otherwise customary areas can only be undertaken by the wealthy and/or connected. Some cases of abuse are known to exist. This conversion could be compared with the one in Zambia and be seen as an example of increasing tenure through legal action combined with land administration.

As can be seen in figure 3, Uganda's 1998 Land Act contains all three approaches in parallel. The first so far has made the most impact (fig. 3 a and d), and could relatively easily be expanded by a good publicity campaign. The third one (fig. 3 b) will only be open to the middle class and businesses, whereas the second one (fig. 3 c) has not yet made worth on its promises due to problems with implementation.

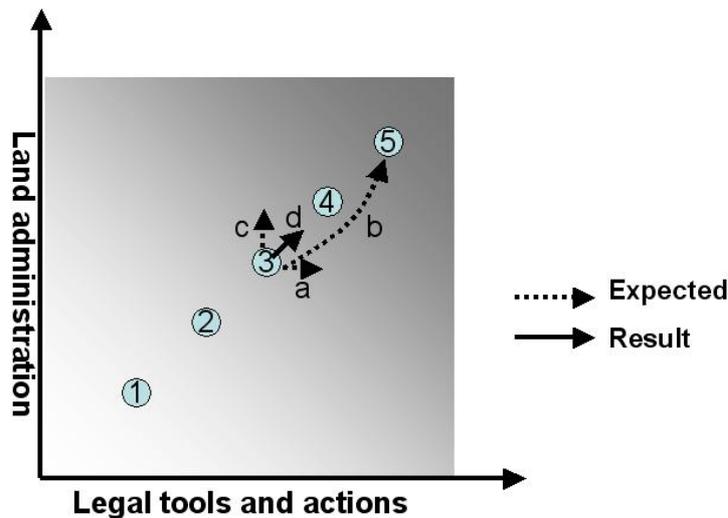


Figure 3 Uganda

### 3.3 Mozambique

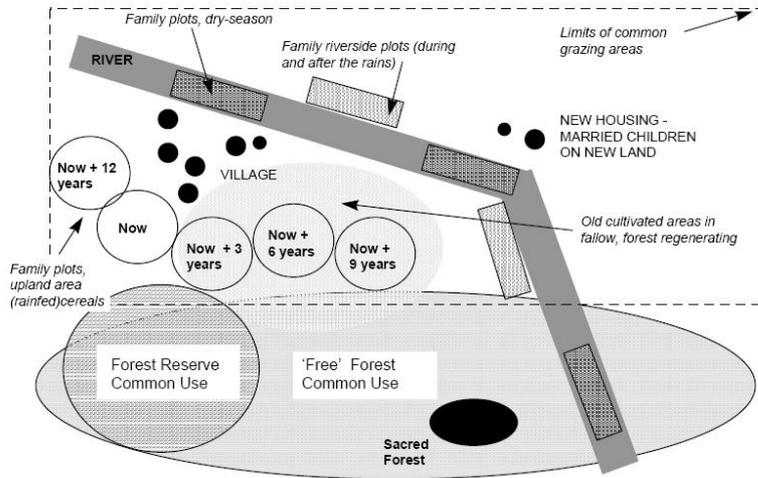
In 1995, three years after the Peace Accord, Mozambique started to work on a new land policy and consequently implemented a new Land Law. The policy developed was guided by two principles: protecting existing rights and creating secure conditions for new investment that would benefit local people and investors alike. The law was primarily designed to prevent land concentration (Tanner, 2002).

Before the Peace Accord, the following law was applicable:

- All land belonged to the state (which is reaffirmed in the Constitution of 1992);
- Statutory law did not recognize customary land law;
- Large farms had been cadastral surveyed.

However, due to the war, most large farms had been abandoned. After the war, many refugees returned home to their villages, in most cases settling according to the customary law. Postwar demand for land was boosted, therefore creating land conflicts. The solution was to integrate customary with statutory law.

TYPICAL AFRICAN RURAL AREA - MIXED AGRICULTURE/LIVESTOCK, SEMI - HUMID TROPICS, WITH SEASONAL RAINFALL FILLING RIVERS: COMMUNITY REVEALED BY FARM SYSTEM ANALYSIS



**Figure 4** Customary farming system (source Tanner, 2002)

A model had to be designed whereby incoming investors could:

1. Find available land in customary areas without conflicts;
2. Support local development in some way (Tanner, 2002).

### 3.3.1 Community land registration

The Land Law created the possibility of community land registration. The community concept was designed to give legal form to the single land unit identified by analyzing farm systems (fig. 4), social organization and land management structures (Tanner, 2002).

The outside boundary of a community is registered through the following process (Chilundo et. al., 2005):

1. Awareness raising;
2. Participatory rural diagnosis;
3. Map making and descriptive record;
4. Returning the map to the community;
5. Registration in the National Land Cadastre Services.

As a result a land certificate will be issued to the community. Almost 200 communities started the delimitation process since 1997 (Chilundo et. al., 2005). Within the community lands, customary norms and practices were acknowledged. The issue of codifying and incorporating the many existing distinct customary systems is avoided in this way (Tanner, 2002).

Any incoming investor can acquire land use rights within community land after consulting the local community leaders. Land can only be allocated to the investor when the land is free,

and has no occupants. As figure 4 indicates, land might look free, however it still belongs to the community.

Problems occur with the implementation of the law, like slow progress, since there is only funding for four delimitations per year (Tanner, 2002; Chilundo et. al. 2005). Nevertheless, Chilundo concludes that community land registration seems to ensure tenure security in relation to other communities and external investors. The same study reveals that individual title registration (which is possible under the Land Law as well) is rare in customary areas.

The case studies from Chilundo et. al. (2005) reveal that:

- Land conflicts still exist within communities, especially boundary disputes (these have to be resolved under customary law);
- Between communities, there can be disputes about the community boundary, especially over the use of natural resources;
- Conflicts between registered communities and investors do occur, although in the case studies few investors were active. The proper consultation of the community is often neglected and the cause of conflict.
- After community registration community members feel secure, there is no need for individual registration;
- In some cases the Land Law was used (after awareness raising through a NGO) to force an outside investor to go to the negotiation table;
- The role of NGO's is fundamental, they are facilitators of the process: awareness raising, legal advice, participation in resolving land conflicts;
- Local people sometimes expect direct results from community land registration, when no improvement was seen after two years, some were disappointed;
- A new National Land Strategy is under debate promoting the partnerships of local communities with private operators in order to boost the economy.

Figure 5 shows that the increase in tenure security (fig. 5 b) is mainly caused by the possibility of community land registration (fig. 5 a). Registration of individual customary rights is not applicable.

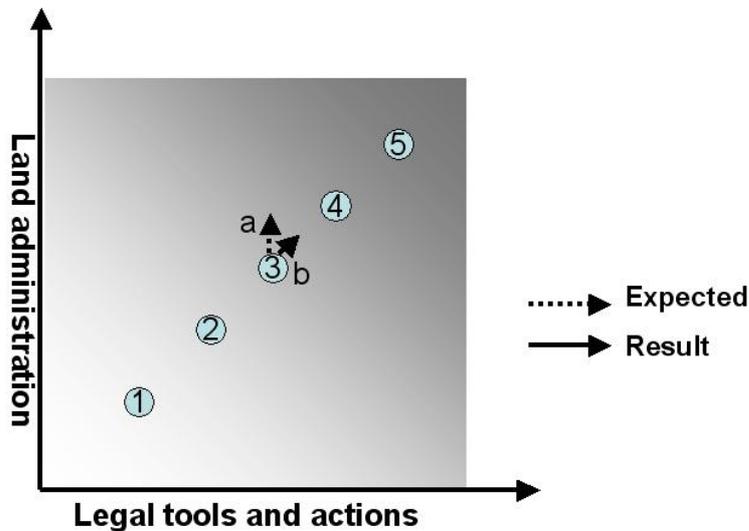


Figure 5 Mozambique

### 3.4 Implementation aspects

As all countries have implemented the new tools to a certain extent, the most important implementations issues will be discussed.

#### 3.4.1 Tenure security for the poor

In Zambia, tenure security is weakened for the poor especially concerning secondary rights. This is caused by the possibility for outsiders to get leasehold in customary areas. For Uganda, theoretically spoken, the poor will get more tenure security. However implementation is problematic, no certificates or titles have been issued yet. Chilundo et. al. conclude for Mozambique that land registration is not anti-poor, investors and locals get equal rights.

#### 3.4.2 Costs

In Zambia, the applicant for leasehold has to pay fees for the application. The amount is high with respect to the poor. In Uganda no fees are involved in case of systematic demarcation, but full fees are charged to the applicant for conversion. Costs in Mozambique are relatively low, as only the outer boundaries of communities have to be surveyed (within the community the customary system will continue, which is cheap). Most costs are to be met by the government; however, limited funds for community registration are released.

### 3.4.3 Public information/NGO-participation

In Zambia the public is not well informed on the land policies. This hampers implementation of the new tools. In Uganda, the public is generally well informed in areas identified for systematic demarcation, but not elsewhere. In Mozambique, the public is well informed and supported by NGO's.

### 3.4.4 Institutional capacity

For all countries, the institutional capacity is reportedly weak. Community registration in Mozambique requires less institutional capacity compared to individual registration in Zambia and Uganda.

### 3.4.5 Implementation

Implementation of land registration in Zambia in customary areas is on ad-hoc basis, driven by the desires of individuals. In Uganda, a planning for systematic demarcation is available, based on local interests, however pilots for systematic demarcation are much delayed. Community registration in Mozambique is on ad-hoc basis and depending on government funding.

### 3.4.6 Gender

In Zambia the land law is gender neutral. However, under customary law, women are disadvantaged. The land law in Uganda is gender friendly, however, the applicable procedures are not fully operational. The land law in Mozambique is gender friendly, as women are entitled to rights themselves. A complete overview on gender issues related to land can be found in Walker (2002).

## 4. CONCLUSIONS

Looking at the three case studies, all countries tried to improve tenure security in customary areas. In the Zambian case, tenure security might be increased for incoming investors within customary areas, however it is clear that tenure security for the local people decreases. In Uganda, the possibility of both certificate and title brings confusion, as certification has not been started since the enactment of the law. For Mozambique, a communal integration of state and customary law has been achieved.

Zambia is the least innovative country from the case studies with respect to innovative pro-poor tools. Uganda is especially innovative on the individual side, Mozambique on the community side. For implementation Mozambique is most successful, although the pace of implementation is slow.

The main aim for the new land policies in the selected countries seems not to be the protection of the rights of the poor, but to try to develop the economy through integration of

the market economy in customary areas concerning land. In itself, most mentioned tools and policies might be effective, however, implementation after a decade has brought little results.

## REFERENCES

- Adams, M., 2003, Land tenure policy and practice in Zambia: issues relating to the development of the agricultural sector, Mokoro Ltd, Oxford
- Aide Memoir 2005, Justification for issuance of freehold titles in systematic demarcation program areas (for the State Minister and Director of Lands and Surveys)
- Augustinus, C., 2003, Comparative analysis of land administration systems: African review, with special reference to Mozambique, Uganda, Namibia, Ghana, South Africa, World Bank,
- Chileshe, R.A., 2005, Land tenure and rural livelihoods in Zambia: case studies of Kamena and St Joseph, University of Western Cape, Bellville
- Chilundo, A., Cau, B., Mubia, M., Malauene, D., Muchanga, V., 2005, Research Report 6 Land Registration in Nampula and Zambezia Provinces, Mozambique, IIED
- Deininger, K., Ayalew, D., Yamano T., 2006, Legal knowledge and economic development; The case of land rights in Uganda, World Bank Policy Research Working Paper 3868
- Mulolwa, A., 2002, Integrated land delivery, Towards improving land administration in Zambia, Delft University Press, Delft
- Payne, G., 2000, Urban land tenure policy options: titles or rights, World Bank Urban Forum, USA
- Smith, R., 2005, Land Tenure and Farm performance in Zambia's Southern province, University of London
- Tanner, C., 2002, Law-making in an African context: the 1997 Mozambican Land law, FAO Legal Papers Online no 26
- UN-HABITAT, 2004, Pro-poor land management, Integrating slums into city planning approaches, Nairobi
- UN-HABITAT, 2005, Land Tenure, Housing Rights and Gender - National and Urban Framework, Nairobi
- Van der Molen. P., 2005, Capacity Development for Land Administration, 10 years anniversary Polytechnic of Namibia, Windhoek
- VVI (Van Vollenhoven Institute), 2006, Guidelines for the development of country and case studies for the project "The Mystery of Legal Failure?", Annex I to the Agenda for the 2nd Mystery of Legal Failure? Workshop, 10-12 May, 2006, Leiden
- Walker, C., 2002, Land Reform in Southern and Eastern Africa: Key issues for strengthening women's rights access to and rights in land, FAO, Harare, Zimbabwe

## BIOGRAPHICAL NOTES

**Paul van Asperen** is currently a project leader within the Ministry of Transport, Public Works and Water Management of The Netherlands. He holds a M.Sc in Geodesy from Delft University of Technology. He has been working as a lecturer at the University of Zambia and ITC. He also worked for the National Mapping Agency in the Netherlands. At the moment he is writing his PhD-proposal in order to return to academics. His main research interest is land

tenure reform in Sub-Saharan Africa.

**Jaap Zevenbergen** is associate professor at the section Geo information and Land Development of the OTB Research Institute for Housing, Urban and Mobility Studies of the Delft University of Technology. He holds Master degrees in geodetic engineering and law and defended his PhD on systems of land registration in 2002. He has published several articles and numerous papers about land registration, including one at each FIG Congress since 1994. He has studied numerous systems of land registration, both as a researcher and as a consultant, the most recent being Uganda, Ethiopia and Croatia.

## CONTACTS

Ir Paul van Asperen  
Ministry of Transport, Public Works and Water Management  
PO Box 5023  
2600 GA Delft  
THE NETHERLANDS  
Tel. + 31 15 2757080  
Fax + 31 15 2757576  
Email: [p.vasperen@agi.rws.minvenw.nl](mailto:p.vasperen@agi.rws.minvenw.nl)  
Web site: <http://www.rijkswaterstaat.nl/rws/agi/home/>

Dr. Jaap Zevenbergen  
Delft University of Technology  
OTB Research Institute for Housing, Urban and Mobility Studies  
Jaffalaan 9  
2628 BX Delft  
THE NETHERLANDS  
Tel. + 31 15 2784418  
Fax + 31 15 2782745  
Email: [j.a.zevenbergen@tudelft.nl](mailto:j.a.zevenbergen@tudelft.nl)  
Web site: <http://www.otb.tudelft.nl/>