

An Analysis of Land Demarcation Practices in Africa at the Emergence of FFP Approaches

Israel TAIWO, Nigeria; Maurice NYANGKORI, Uganda; Erumbi KEZIA, Uganda; Edwin NYANDECHE, Kenya; Letwin PONDO, Zimbabwe; Sylion MURAMIRA, Rwanda; Ibrahim MUKAILA, Nigeria

SUMMARY

Land demarcation is done either with fixed boundaries or general boundaries. The use of general boundaries has gained more attention since the advent of fit-for-purpose campaigns due to the need to fast-track land registration processes. This paper, examines, analyses and reports on land demarcation practices in Africa before and after the FFP approach, the impacts of the fit-for-purpose approaches of land demarcation on land administration in the African continent, effects of land demarcation on land registration timelines, the role of surveyors and para-surveyors on land demarcation, influence of urban-rural expansion on land demarcation practices and challenges to implementing the fit-for-purpose land administration approaches in Africa. The study conducts SWOT analysis on the impacts of the use of general and fixed boundaries in the land administration systems of Nigeria, Uganda, Rwanda, Kenya, Zimbabwe and some other parts of Africa. The results reveal that both approaches have advantages and disadvantages, especially when considered from both the present and future perspectives. The paper concludes by suggesting a careful adoption of land demarcation approaches and a witting use of the FFP concepts in land administration by professionals and non-professionals.

Keywords:

Fit-for-Purpose; Land Demarcation; Fixed Boundaries; General Boundaries; Para-surveyors

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1. INTRODUCTION

Land demarcation is a crucial part of mapping land rights and ensuring land tenure security. It is one of the earliest actions of organized human groups which defines property boundaries, parcel shapes, and plot locations (Libecap & Lueck, 2011). There are different classes of land demarcation. Arruñada (2018) distinguished between physical and legal land demarcation. In this work, the term land demarcation implies boundary delineation and boundary data capture. The term does not include the aspects of legal land demarcation as described by Arruñada (2018). Boundary Delineation is of various types including manual, semi-automatic and automatic boundary delineation (Nyandwi, Koeva, Kohli, & Bennett, 2019; Wassie et al., 2017). Manual boundary delineation involves identifying all the points defining the extent of property rights, usually with physical objects. Automatic boundary delineation uses algorithms to identify boundaries of parcels based on input data. Automatic boundary delineation automatically extracts features using remote sensing and computer algorithms to determine the extent of land rights. Boundary data capture involves acquiring the true or relative position of points delineating parcels. It includes methods of theodolite traversing; GNSS survey; mapping with drones, satellite imagery, orthophotos, etc. Boundary data capture has improved from the use of sketches, tapes/chains, compass, and plane tabling into theodolite traversing, total station traversing, GNSS survey etc. In recent times, the need for faster methods of mapping has necessitated the use of drones, satellite imageries, and orthophotos for boundary data capture, which are used in both manual and automatic boundary extraction.

The term Fit-For-Purpose (FFP) existed before its application to land administration (Oliver, 2005). FFP land administration suggests that land administration in developing countries should be flexible and dynamic enough to meet the needs of the system. The term discourages a one size fits all approach to standards for land administration and encourages that the administration of land can be based on achieving a goal (Enemark, Clifford, Lemmen, & McLaren, 2014). One of the concepts of the FFP approach is the idea of implementing general boundaries instead of fixed boundaries. *The term “general boundary” means one whose position has not been precisely determined and is usually less accurate (the delineation relates to physical features in the field) while “fixed boundary” means that it has been accurately recorded* (Enemark, Clifford, et al., 2014). Among several other points raised, it is believed that if an FFP approach is adopted, the use of general boundaries in most African countries is sufficient for most land administration purposes, especially in rural and semi-urban areas (Enemark, McLaren, & Lemmen, 2016). Although the FFP approaches existed in context, it was not widely known and accepted as terminology in the surveying profession until after it was recognized and FIG Publication No. 60 was produced by the FIG and the World Bank in 2014.

This study analyses land demarcation and FFP approaches to land demarcation. The paper discusses land demarcation practices in Africa before and after the FFP concept, the impacts of FFP approaches to land demarcation on land administration, challenges to implementing the FFP land administration approaches and the affordability of land demarcation practices before and after the FFP concept. The paper further provides an analysis of the effects of land

demarcation practices on land registration timelines, the use of para surveyors for land demarcation and the influence of urban-rural expansion on land demarcation practices.

The paper highlights the above by providing an introduction to land demarcation practices and the FFP approach to land administration. Materials and methods used in conducting the survey and drawing inferences were documented. Results and discussions were presented after which conclusions and recommendations were made. A part of the discussion is devoted to country-specific case studies and some parts of the discussions reported on information gathered during the “What Next?” session of the January 2021 VCSP Wisdom Workshop tagged “Sustainable Solutions for Land-Based Community Problems - Tools and Modern Approaches”, the regional breakout session tagged “Influencing regional land-based solutions” of the December 2021 VCSP Wisdom Workshop tagged “Promoting Tenure Security in the face of Legal, Institutional and Social Challenges”, and its subsequent follow-up meetings. Although the research is currently not tagged as conclusive by the authors, preliminary conclusions were drawn based on the observations and discussions made at this present stage of the research.

2. MATERIALS AND METHODS

2.1 Study Area

The study focused on Africa. Responses to the survey were received from; Nigeria, Uganda, Rwanda, Kenya, Zimbabwe, Ghana, South Africa, and Zambia.

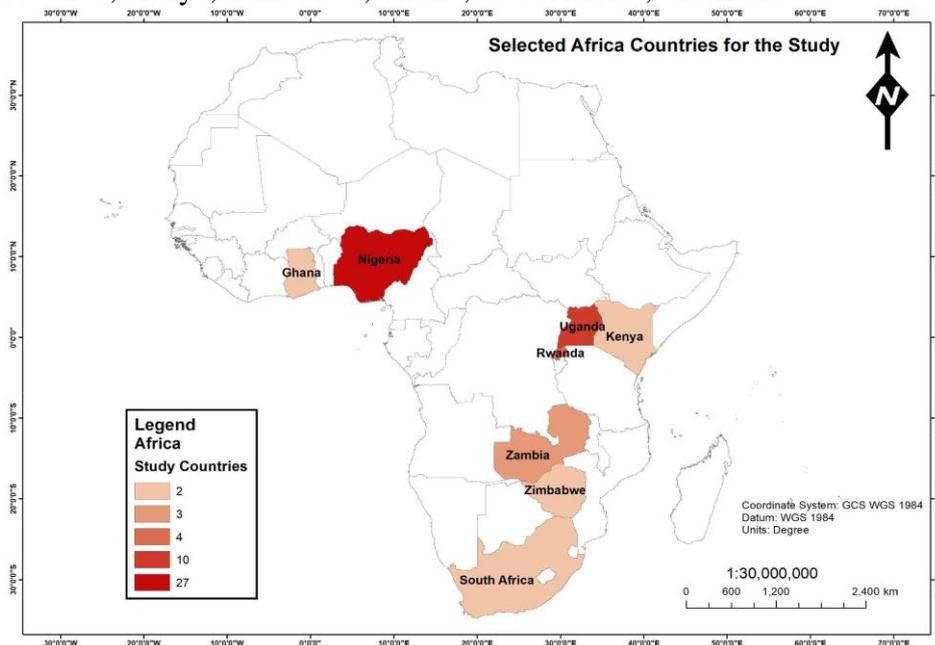


Figure 1: Responses to the survey from African Countries

2.2 Study Design and Implementation

A combination of quantitative and qualitative methods were adopted to respectively examine the perspectives of respondents to the questions raised. After designing the survey, exploratory and correlational research analytic methods were adopted to highlight widely held opinions from the survey and past VCSP Wisdom Workshops. Results were presented using charts as

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acquired from the responses section of the google form that was designed, some charts were produced from Microsoft Excel Spread Sheet and a study area map was produced from ArcGIS. A link to the survey questions is attached [here](#). The survey opened for approximately 9 days between the 27th of March and the 5th of April, 2022. 52 of the 53 responses obtained were made on countries or provinces of countries in Africa. The survey was conducted such that participants can respond to the form on a state/provincial level, country-level, or continental level. Out of the 52 African-related responses received, 33 (62.9%) are country-based, while 19 (35.8%) are based on state/province. Participants willing to respond in multiple categories were encouraged to submit multiple responses. Only two participants of the survey responded both at the state/province and country levels. On the survey form and in this paper, land demarcation is defined as boundary delineation and data capture.

The survey form was directed at surveying professionals with experience in African land Administration. After the survey, it was discovered that 94.3% of the responses came from surveyors. The survey also shows that 48 responses which amount to 90.6% of the total responses came from responders of African origin. 39 (73.6%) live in Africa, 5 (9.4%) have lived in Africa, 36 (67.9%) work in Africa, and 4 (7.5%) worked in Africa. 36 (67.9%) came from persons that have experience in African land administration and 4 (7.5%) of responses came from persons having little experience in African land administration.

3. RESULTS AND DISCUSSIONS

3.1 Land Demarcation Practices and the FFP Approaches in Africa

3.1.1 Land Demarcation Practices in Africa and the Emergence of the FFP Approach

Delimiting and demarcating land in Africa has been influenced by several factors, part of which includes the abundance of land in the early centuries, the superimposed boundary of the European colonial masters (AUBP, 2013), improvements in demarcation technologies and the FFP approach to land administration among others. Land demarcation practices can be classified according to the nature of instruments, objects or methods used in identifying the delineating points and how the points delineating land have been determined. The FIG guide on FFP land administration classifies this into general boundaries and fixed boundaries.

The term FFP land administration was coined from the need to build sustainable, effective and efficient land administration systems that give priority to meeting the needs of tenure security at different levels above compliance to top-end technological solutions and rigid regulations. The concept recognizes a continuum of land rights and considers that spatial units may not only be a land parcel, a continuum of data capture methods and technologies, a continuum of accuracies and the recognition of various forms of land records (Enemark, Bell, Lemmen, & McLaren, 2014; Enemark et al., 2016).

The emergence of the FFP approaches to land administration in Africa developed from different actions. A majority – 60% of the 20 respondents to the qualitative survey that was conducted - agreed that the FFP approach developed in Africa after it was recognized by the FIG and World Bank in 2014. Some indicated that before the 2014 adoption of the FFP approach by the FIG and World Bank for land administration in developing Countries, the FFP has been in existence in countries like Uganda in an informal way. Some also identified that the FFP approach

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emerged as a result of the dearth of surveyors in parts of Africa, which of course started before 2014.

The survey conducted indicates that more than half of the respondents have very good knowledge of the FFP methods of land demarcation practices. The survey reveals that 41 responses (77.4%) came from persons that are very familiar with the concept of general boundaries, out of which only 32.1% affirmed the use of general boundaries in their countries or part of their country. 67.9% indicated the use of fixed boundaries in their countries or part of their country.

3.1.2 Pre and Post FFP Boundary Data Capture Methods in Africa

Before and After

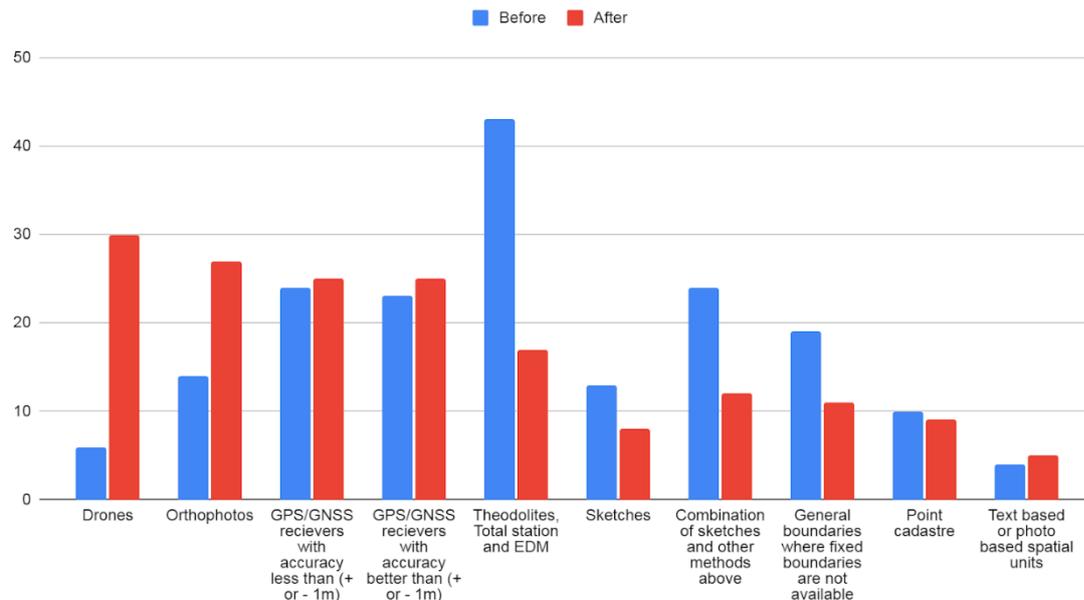


Figure 2: Pre and Post FFP Boundary Data Capture Methods in Africa

Modern methods of land demarcation before the advent of the FFP approach include the use of theodolites, total station, GPS/GNSS, etc. Before the FFP approach, the use of theodolites, total stations, and EDM in mapping land rights was prevalent as identified by 81% of respondents. Next to it was mapping land rights with GPS/GNSS and mapping land rights with a combination of sketches and other conventional surveying methods. As shown in Figure 2, the advent of the FFP approach has significantly increased the use of Drones and orthophotos for land rights mapping. 49% of respondents indicated that their knowledge of land demarcation practices has improved since the advent of FFP land demarcation practices.

3.2 The Role of Surveyors and Para Surveyors on land demarcation

Para-surveyors have little or limited knowledge in surveying. They are locally recruited and specially trained staff who carry out ad-hoc responsibilities in the surveying profession. Para-surveyors are trained in one or a combination of tasks of carrying out land boundary data capture, processing and managing collected data for land registration and storing the collected data in databases for easy access, retrieval, information sharing, etc. (Enemark, Clifford, et al.,

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2014; Taiwo, Mwesigye, & Buxton, 2021). Some para-surveyors even get training in establishing and densifying geodetic reference points for surveying land.

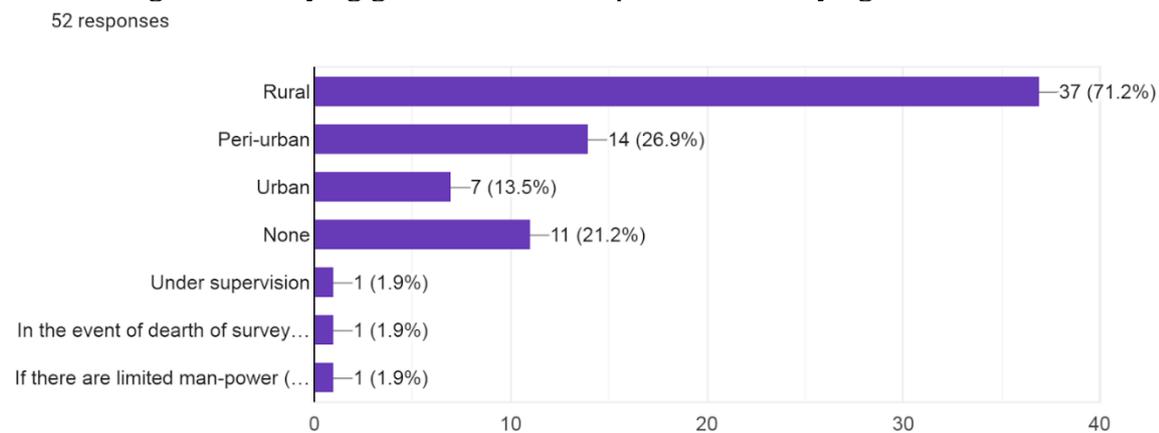


Figure 3: The Use of Para-Surveyors in Rural, Peri-urban and Urban Areas for Land Demarcation.

From the survey conducted such that respondents can choose several options, 71.2% of 52 respondents agree that para-surveyors can be used in surveying rural areas. One of the reasons advanced for which para-surveyors should be limited to rural areas is the need for higher standards in peri-urban and urban areas. 26.9% agree that para-surveyors can be used in the peri-urban, and 13.5% agree they can be used in urban areas. 21.2% of respondents indicated that para-surveyors should not be used in surveying operations because the chances of disputes are low when the use of para-surveyors is discouraged and because the problems associated with the use of para-surveyors are more administrative rather than technical. Respondents to the survey also indicated that para-surveyors should be used under supervision and only if there is limited manpower (professionals) for any land demarcation exercise. A caveat was placed that the use of para-surveyors should not be a priority. And that para-surveyors should be used only in countries experiencing a dearth of surveyors. 81.1% i.e. 43 out of 51 respondents identified the need to fast-track land registration processes as a reason why para-surveyors should be engaged while 19 of the respondents, amounting to 35.8% highlighted the need for more affordability as a reason to engage para-surveyors. This agrees with the dictates of the FFP approach that advocates the use of para-surveyors for land registration projects in other to scale-up land registration in developing countries (Enemark, Clifford, et al., 2014).

3.3 Influence of Urban-Rural Expansion on Land Demarcation Practices

As one of the questions that emanated from the “What next?” session of the VCSP wisdom workshop, the paper considered the influence of urban-rural expansion on the use of general boundaries and fixed boundaries for land demarcation. 70% and 65% of the 20 respondents to the qualitative section of the survey responded that the expansion of urban areas into rural lands impacts the use of general boundaries and fixed boundaries respectively for land administration in their areas.

Responses to the survey indicate that with the increased urbanization of states and countries, the need for accurate data cannot be overemphasized to reduce the risk of disputes and conflicts. Hence a need to keep the future use and status of land in perspective while adopting the FFP Approach. Another response indicates that if general boundaries were done correctly and connected to the National Grid, then the expansion of the urban areas into rural will just fit in

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properly. It is also important to point out that planning authorities in some urban areas have strict requirements that are not covered by the FFP approach. This makes it more possible to implement general boundaries and other FFP approaches in rural areas with fewer conventions and standards. Hence, the need to back-up FFP approaches with policy remains vital.

Because land is so valuable in urban areas, accuracy and precision are essential. The quest for land is greater in the urban centres than in the rural areas because residents of urban centres do not want to lose an inch of it. General boundaries provide less accuracy and the expansion of urban areas in rural lands results in land fragmentation whereby individual parcel owners require better accuracy when conducting measurements of their lands. Urban areas need higher accuracy cadasters, whereas rural areas do not. However, when rural areas are registered with available FFP approaches before urbanization, it significantly reduces the number of conflicts in the area, and the area can be re-documented soon. Nevertheless, the cost of first registration and then re-documentation needs to be appraised.

It is also important to note that as urban land increases, the quest and value of land increases, the need for a higher level of accuracy in boundary data capture increases, a new purpose is defined for land and then a new method is needed to re-demarcate land. The advent of low-cost GNSS and other boundary data capture techniques can be leveraged to acquire accurate data so that the future purpose of the land is kept in perspective.

3.4 Impacts of FFP approaches to Land Demarcation on Land Administration

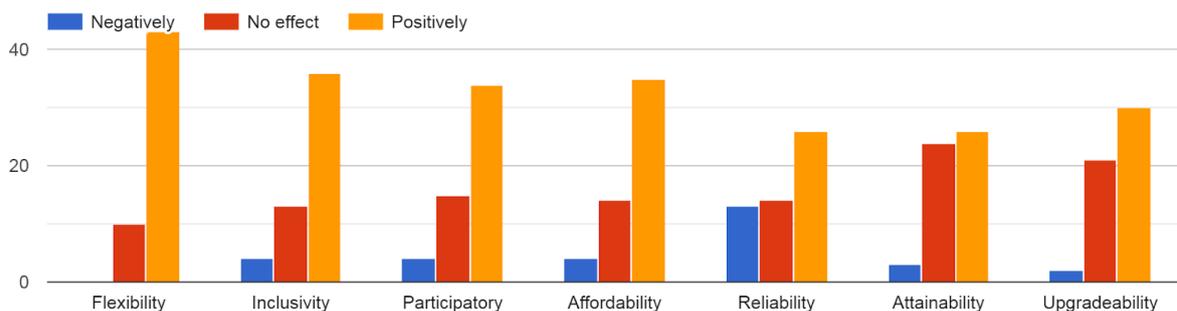


Figure 4: Impacts of FFP Approaches to Land Demarcation on Land Administration

The responses obtained show that the FFP approach to land demarcation has positively impacted land administration when assessed using the underlying principles of flexibility, inclusivity, participatory, affordability, reliability, attainability and upgradeability. Except for reliability, which obviously can be attributed to the role of para-surveyors in land demarcation as identified from the responses obtained, it can be said that the FFP approach to land demarcation positively impacts land administration towards achieving security of tenure and land rights for Africa.

Furthermore, the comparison made between responses of participants with questions on the affordability of land demarcation practices before and after the FFP approach to land administration indicates a positive trend. Land demarcation practices generally became more affordable at the commencement of the FFP approach.

3.5 Effects of Land Demarcation on Land Registration Timelines

20 responses

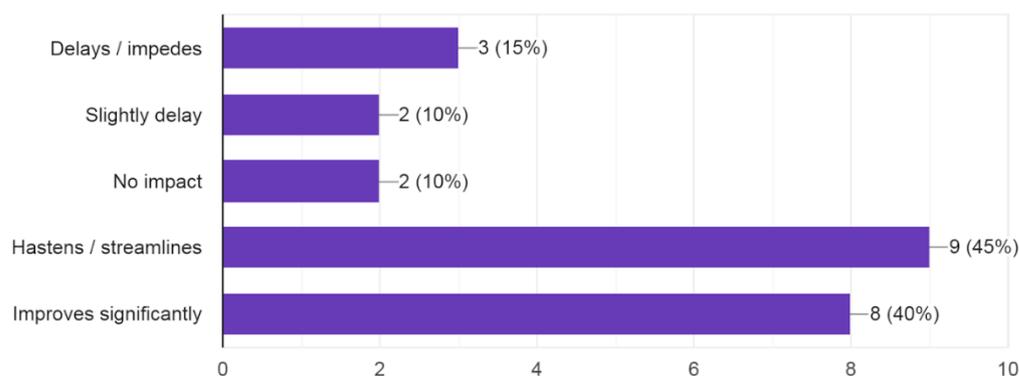


Figure 5: How FFP land demarcation practices other than the inclusion of para-surveyors affects land registration timelines

66% (35 out of 53 respondents) agree that land demarcation affects land Registration timelines. 13.2% (7 out of 53 respondents) are uncertain about if land demarcation affects land registration timelines and 20.8% (11 out of 53 respondents) indicated that land demarcation does not affect land registration timelines.

20 respondents responded to the question on; how do you perceive that FFP land demarcation practices other than the inclusion of para-surveyors affects land registration timelines? Out of the 20 respondents, 8 respondents indicated that aside from the involvement of para-surveyors in land registration processes, the FFP land demarcation practices significantly improve land registration timelines. 9 indicated that the FFP land demarcation practices hasten/streamline land registration timelines.

3.6 Challenges to implementing the FFP Land Administration Approaches

As observed from existing works of literature and the survey conducted, the importance of the FFP approach cannot be over-emphasized. 88.7% of respondents to the survey indicated hesitancy within the surveying community, legal profession or general community to the acceptance and use the FFP approaches for land demarcation. Since 94.3% of respondents to the survey are surveyors, it can be implied that regardless of the admitted importance of the FFP approach to land administration in Africa, a strong hesitancy is recognized among surveyors to its implementation. One of the issues identified is the involvement of para-surveyors in land demarcation activities. 71.7% (38 out of 53) of respondents identified that the FFP approaches make data capture possible for untrained persons, 60.4% indicated that Surveyors are unwilling to trade off accuracy, 58.5% identified that FFP approaches subject land demarcation to a lower order of accuracies, 49.1% identified that Professionals demand survey plans with high accuracies, 43.4% identified that organizations demand survey plans with high accuracies and only 1.9% mentioned high-density development as a reason for hesitancy among professionals (Survey Community) as reasons for hesitancy.

Two main reasons were identified in the qualitative segment of the survey conducted as reasons why hesitancy exists from Surveyors in the implementation of the FFP approach. The difficulty created in sorting out land boundary disputes was identified as a major reason for hesitancy by surveyors. Secondly, High-density development due to urbanization meaning buildings are built

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on or very close to boundaries so accuracy needs to be high to avoid overlap with adjacent parcels was another reason that was advanced for hesitancy by professionals. Non-inclusion of professional Surveyors in the implementation of the FFP approach was as well identified as a reason for hesitancy, the need to educate the public more about the FFP approach was another reason that was identified.

Another reason for hesitancy from professionals was identified as the lack of adequate training on the concept. The conventional process of land registration has been made part of the curricula of most surveying students, thereby aiding training and capacity building in its knowledge. The knowledge of the FFP approach also needs to be embedded in the curriculum of students in the Surveying Community, so that adequate knowledge of the design and implementation of the approach can be passed on to young professionals. It was noted that Registered Surveyors are unwilling to adopt the FFP approaches because of the fear of affecting the survey practice in the state. Adequate training in the concept and its business model will enlighten surveyors on why the approach should be embraced and how it can be leveraged for professional relevance, which will in turn produce financial success. Surveyors need to accept the need to implement approaches that fit their environment. Also, the surveyor needs to be retained at the echelon of making appropriate decisions concerning what land demarcation (boundary data capture technique) should be adopted in a particular situation. Ultimately, dynamism needs to be ensured.

3.7 Country Specific Case Studies

Land remains a non-increasing factor of production necessary for man's and the environment's survival (Chigbu, Bendzko, Mabakeng, Kuusaana, & Tutu, 2021; Negrão, Carvalho, Donato, & Manhican, 2004; Taiwo, Adewole, Fagbeja, & Balogun, 2020; Taiwo, Daramola, & Pepple, 2016). The complexity of the challenges of tenure security in different countries of the world requires local and regionally based solutions. The FFP approach can be used at the global, regional, local or case-specific level, hence, the solutions it offers are expected to be adapted before adoption.

3.7.1 Nigeria

To explore the impact of FFP approaches on land administration in Nigeria, the 27 responses gotten from Nigeria or parts of Nigeria were analyzed. The result of the survey shows a strong hesitancy in the implementation of FFP approaches among surveying professionals in Nigeria. 85% of respondents identified that there are hesitations in implementing the FFP approach in the country. The highlighted reasons for the hesitancy were that FFP approaches make data capture possible for untrained persons and subject land demarcation to a lower order of accuracies, surveyors are unwilling to trade off accuracy, professionals demand survey plans with high accuracies, and financial institutions demand survey plans with high accuracies. Figure 6 shows a pie chart of the hesitancy level.

To explore the strength of FFP approaches in the places where it is being practised in Nigeria, responses to the question of how FFP approaches to land demarcation have impacted land administration in the areas of flexibility, inclusivity, participation, affordability, reliability, attainability, and upgradeability were analyzed. The result of the analyses is shown in Figure 7. Also, the survey looks into the affordability of land demarcation since the advent of FFP approaches. The affordability was explored on a scale of 1 to 5, depicting not affordable to

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affordable. Figure 8 shows that 44.4% of the respondents said FFP approaches make land demarcation affordable while 29.6% said otherwise.

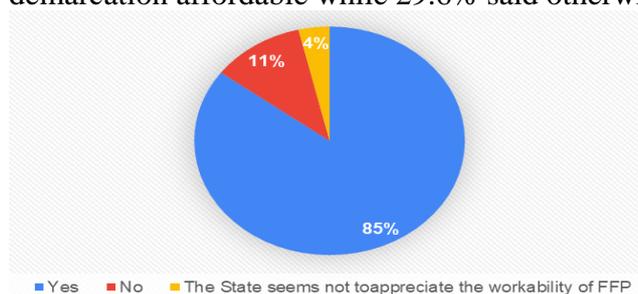


Figure 6: Land Professionals' Hesitancy in Adopting FFP Approaches to Land Administration in Nigeria

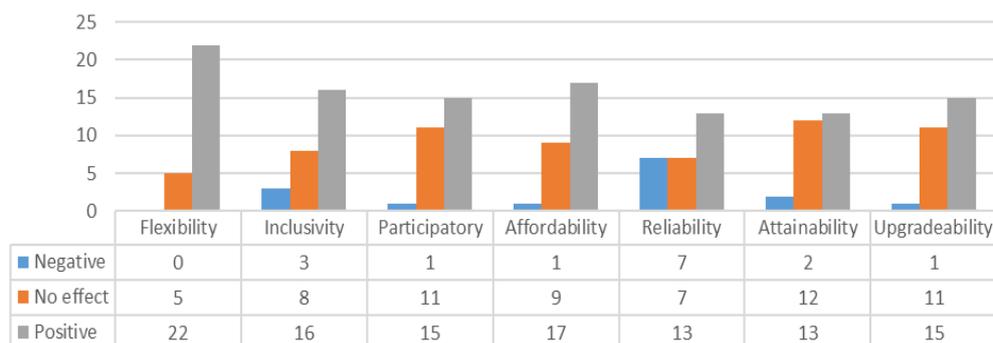


Figure 7: Impacts of FFP Approaches to Land Demarcation on Land Administration in Parts of Nigeria

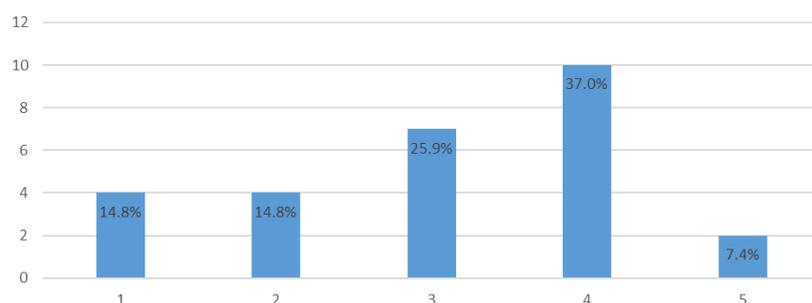


Figure 8: Affordability of land demarcation practices since the advent of FFP approaches in Parts of Nigeria

3.7.2 Uganda

It was observed that the different land stakeholders have successfully adapted to FFP approaches to register land rights all over the country considering that the methods being used are easy, cheaper, and flexible. These approaches have encouraged several para-surveyors, especially in rural areas to participate in the demarcation of land. Uganda at large is also willing to adapt to the various approaches available to demarcate its land parcels, both in rural and urban areas. There is an existence of reliable and effective governance on existing tenure systems.

However, from the survey done, surveyors mentioned that FFP results cannot be incorporated into the current National Land Information System (NLIS) because of their differences in accuracy. They also mentioned that the process is slow compared to other methods. Mistakes happening from para-surveyors owing to their limited knowledge, thereby reducing the accuracies attained is another setback of the approach in Uganda. Another weakness of the

approach is the bad visibility of the orthophotos that are being used during the demarcation process which has attracted inconsistency in the data collected.

The following were identified as opportunities for the FFP approach to land demarcation in Uganda.

1. Adjusting the existing National Land Information systems to accommodate a continuum where FFP approaches can be added.
2. Conversion of land data from analogue to digital.
3. Availability of volunteer surveyors to help bring the approach to life in the country.

Threats of the FFP approach on land demarcation in Uganda.

1. Negative attitude to the approach by Surveyors.
2. The approach requires funding from the government or NGOs especially because of the pro-poor approach.
3. Poor accuracy because of the overlaps observed when compared to the other methods.
4. Limited awareness as most land managers are ignorant about the existence and know-how of the FFP approach.
5. Excessive political influence on the ministry of lands and how they handle land matters.
6. Corruption in the country is crippling most of the organizations willing to contribute to the cause.

3.7.3 Rwanda

The strengths of the FFP approach to land demarcation in Rwanda include the following:

1. Evidence-based and cost-effectiveness.
2. Availability of highly accurate land administration solutions in Rwanda.
3. Visible (physical) boundaries are most considered, thus the accuracy and precision in land demarcation increased.
4. Rwanda's land tenure became effective after FFP practices that followed its land reform.
5. Some land issues related to parcel boundaries inherited during the precolonial and colonial regimes and the period from independence have been addressed through FFP Approaches.
6. Land governance in Rwanda has progressively changed.
7. Land tenure security has been improved.
8. FFP ensures private land rights through secured land rights and effective land use and management that contribute to the country's social and economic development
9. Land-based investments increased after the adoption of the FFP approach because Rwandans who own land have access to credit.
10. Consultation at every stage reduces errors that might result in conflicts and inequity in land registration.

The weakness of the FFP approach on land demarcation in Rwanda

1. Precision in the measurement of fixed boundaries is not excellent.
2. Large numbers of attribute information collected are not used.
3. Public consultation in the demarcation of parcels is not enhanced.

Opportunities of the FFP approach to land demarcation in Rwanda

1. Good governance and political will of the Rwanda Government
2. Enhancement of social inclusion increased equity and better recognition of human rights.

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3. Improved security of tenure and reduction of land-related conflicts in Rwanda
4. Business opportunities and investment development in the land sector.
5. The institutional and technical frameworks are strengthened to address the challenges in delivering security of tenure at scale, particularly for the poor.
6. Improved local development through investments in housing, agriculture, environment, and infrastructure.

Threats of FFP approach to land demarcation in Rwanda

1. Some Rwandan land professionals are still reluctant to comply.
2. Lack of quality of the evidence of land rights.
3. Land professionals and local land officers are not well trained in FFP.
4. Insufficient budgets and finances for FFP
5. High cost of land transfer services.
6. High cost of suitable land surveying equipment.

3.7.4 Kenya

According to the survey done and the responses received the FFP approach straightens, simplifies, and supports land administration. Other strengths are highlighted below:

1. Increased land-based investments across the country.
2. Some of the land issues witnessed in the country have been solved by the use of the FFP Approach.
3. There has been an improvement in tenure security in the country.
4. Land governance has become more effective.
5. FFP Approach is fast and cost-effective
6. The FFP approach makes the process of land registration simple and easy.

Weaknesses of the FFP Approach on Land Demarcation in Kenya

1. The level of public participation is not sufficient.
2. The hesitancy of Surveyors to trade off accuracy.
3. The political class is unwilling to comply and embrace the FFP Approach.
4. Corruption in the land institutions greatly affects the process in many ways.

Opportunities of the FFP Approach on Land Demarcation in Kenya

1. Increased public participation has been seen across the Country during the land demarcation process.
2. Improved local investments across the country have been seen.
3. The FFP approach brings about the use of new technology in the process of land Demarcation.

Threats of the FFP Approach on Land Demarcation in Kenya

1. High cost of land surveying service in the country.
2. The land professionals in Kenya are still reluctant to adopt the FFP Approach.
3. The accuracy level of the FFP Approach on Land Demarcation in Kenya is low.
4. Some organizations and registered surveyors undermine para-surveyors because there is a need for higher accuracies in work submitted
5. The process of land surveying service in the country is long with so many requirements.

3.7.5 Zimbabwe

From the survey conducted, it was highlighted that among other things the FFP Approach simplifies the land registration process as it is affordable, less expensive, and fast. It also has these strengths:

1. Increases the number of households with the security of tenure in the country
2. The inclusion of para-surveyors who love their work and are willing to even work overtime just to make sure the work is finished
3. Para-surveyors are generally patient and help reduce the time taken to complete tasks

Weaknesses of the FFP Approach on land Demarcation in Zimbabwe

1. Surveyors are unwilling to trade off accuracy
2. Absence of political will in embracing the FFP
3. Resistance from the professionals such as surveyors
4. The inclusion of para-surveyors also at times contributes to the poor accuracy of the results

Opportunities of the FFP Approach on land Demarcation in Zimbabwe

1. FFP approaches make data capture possible for untrained persons
2. The Approach incorporates para-surveyors also into action who are in most cases dedicated to working hence their exposure
3. New technology and new approaches which the youths love to exploit

Threats of the FFP Approach on land Demarcation in Zimbabwe

1. FFP approaches subject land demarcation to lower orders of accuracies
2. There will be no one size fits all solution in terms of accuracy. Fundamentally adoption of a continuum of accuracies and toolbox will expedite the cadastral data acquisition
3. Surveyors and organizations require greater accuracy thereby side-lining para surveyors
4. Less work for Surveyors means their fear of losing their jobs hence low acceptance within the country

3.7.6 Case Study of Zambia, South Africa, Ghana

6 responses were received from Zambia, South Africa and Ghana. The use of general boundaries and fixed boundaries cut across different parts of the countries. The Strengths of the FFP approach to land demarcation in Zambia, South Africa and Ghana include the fact that some surveyors in the three countries use the general boundaries approach to land demarcation. This is an indication that para-surveyors can easily be employed to carry out surveys for land registration, especially in rural and peri-urban areas of the countries. The beauty of this approach is that it makes land demarcation and ultimately land registration affordable, pro-poor and thus resulting in the benefit of having more land registered and reducing boundary conflicts in such areas.

It was identified in Zambia, South Africa and Ghana that using general boundaries approach by surveyors and para-surveyors helps to achieve the goal of improving land administration in rural and semi-rural areas. This is because the accuracy requirements for the urban areas are higher, given the fact that land is more fragmented in highly urbanized areas. The general boundary approach will eventually not solve the land administration issues in the urban areas.

Opportunities of the FFP approach to land demarcation in Zambia, South, and Ghana include the below:

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1. From the responses given by the surveyors in the three countries, there's an advantage to providing solutions to land administration issues in the rural, semi-rural, and urban areas. This is because some are practising general boundaries and these surveyors/para-surveyors can cover the rural areas while the others who are practising a fixed boundary approach can cater for the urban and semi-urban areas where there are higher accuracy requirements.
2. There's also a chance of increasing the percentage of registered land in the three countries.
3. Opportunity to reduce the cost of land demarcation, land administration, and land registration.
4. Opportunity to promote voluntary services by young surveyors and mentoring programs by senior surveyors to young surveyors.

Threats

1. Reluctance by most professional surveyors to accept FFP
2. Surveyors are more interested in ring-fencing the profession and yet a general boundary approach to land demarcation can be done by anyone who is not qualified as a surveyor for example.
3. Future land conflicts - as urbanization eventually increases whereby rural areas get urbanized and more land gets fragmented, there's a possibility that a fixed boundary approach will be used and therefore resulting in possible gaps/overlaps, hence the resultant boundary conflicts.
4. The existing National laws may not support most FFP approaches to land demarcation practices. These laws require amendments, which sometimes attract political strikes and thereby cause delays in land transactions rather than promoting quick land transactions.

CONCLUSION & RECOMMENDATIONS

The knowledge of land demarcation practices has improved among surveyors since the advent of the FFP land demarcation practices. However, the knowledge of the FFP approach is still being confused by many. The implementation of the FFP approach needs to be done with the understanding of the phrase “fit for purpose”. Many, including professionals, assume the FFP approach is a set of methods that fast-track land registration at the expense of accuracies or necessary policies required for land registration. More training is required, especially within tertiary institutions teaching surveying so that young professionals can be trained in the use of conventional surveying procedures with the fit-for-purpose concept in perspective. The concept does not neglect accuracy, rather, it seeks the adoption of methods and standards that are fit for particular purposes to achieve tenure security. One area that requires adequate attention in the implementation of the approach is that professionals with the requisite knowledge need to be engaged in all decision-making processes to ensure the fitness of the approaches being adopted for particular purposes.

Furthermore, responses to the survey conducted indicate that with the increased urbanization of states and countries, the need for accurate data to reduce the risk of disputes and conflicts cannot be overemphasized. While adopting the FFP Approach, it is important to keep the present and future use of land in perspective to balance the adoption of methods on a short and long term duration.

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The 85% of 20 responses to the qualitative assessment segment of the survey conducted show that the FFP land demarcation procedures improve land registration practices. To aid better results, the FFP approach must be backed up with enabling policies and spatial frameworks necessary to aid its integration. The FFP allows for regional, local and case-specific methods. Hence, the paper concludes by suggesting a careful adoption of land demarcation approaches and a witting use of the FFP concept in land administration by professionals and non-professionals.

REFERENCES

- Arruñada, B. (2018). Evolving practice in land demarcation. *Land Use Policy*, 77, 661–675. <https://doi.org/10.1016/J.LANDUSEPOL.2018.05.050>
- AUBP. (2013). *Delimitation and Demarcation of Boundaries in Africa; General Issues and Case Studies* (First). Ethiopia: Commission of the African Union / Department of Peace and Security (African Union Border Programme). Retrieved from <https://www.peaceau.org/uploads/au-2-en-2013-delim-a-demar-user-guide.pdf>
- Chigbu, U. E., Bendzko, T., Mabakeng, M. R., Kuusaana, E. D., & Tutu, D. O. (2021). Fit-for-Purpose Land Administration from Theory to Practice: Three Demonstrative Case Studies of Local Land Administration Initiatives in Africa. *Land 2021*, Vol. 10, Page 476, 10(5), 476. <https://doi.org/10.3390/LAND10050476>
- Enemark, S., Bell, K. C., Lemmen, C., & McLaren, R. (2014). Fit-For-Purpose Land Administration. *International Federation of Surveyors (FIG)*, (60), 44. <https://doi.org/https://www.fig.net/resources/publications/figpub/pub60/Figpub60.pdf>
- Enemark, S., Clifford, K. B., Lemmen, C., & McLaren, R. (2014). *Fit-For-Purpose Land Administration*. International Federation of Surveyors (FIG). Retrieved from www.fig.net
- Enemark, S., McLaren, R., & Lemmen, C. (2016). *FIT-FOR-PURPOSE LAND ADMINISTRATION: Guiding Principles for Country Implementation*. Nairobi.
- Libecap, G. D., & Lueck, D. (2011). The Demarcation of Land and the Role of Coordinating Property Institutions. *Source: Journal of Political Economy*, 119(3), 426–467. <https://doi.org/10.1086/660842>
- Negrão, J., Carvalho, A. De, Donato, J., & Manhicane, T. (2004). *Urban land market in Mozambique*.
- Nyandwi, E., Koeva, M., Kohli, D., & Bennett, R. (2019). Comparing Human Versus Machine-Driven Cadastral Boundary Feature Extraction, 1–23.
- Oliver, D. (2005). Medical input, rehabilitation and discharge planning for patients with hip fracture: Why traditional models are not fit for purpose and how things are changing. *Current Anaesthesia and Critical Care*, 16(1), 11–22. <https://doi.org/10.1016/J.CACC.2005.01.005>
- Taiwo, I. O., Adewole, L., Fagbeja, M., & Balogun, I. (2020). Web-Based Geospatial Information System to Access Land Suitability for Arable Crop Farming in Ekiti State, Nigeria. *FIG Peer Review Journal*, (2412-916X). Retrieved from <https://www.fig.net/resources/publications/prj/showpeerreviewpaper.asp?pubid=10280>
- Taiwo, I. O., Daramola, O., & Pepple, T. G. (2016). Web-based Cadastral Information System for Land Management (8035). In *Recovery from Disaster*. International Federation of Surveyors (FIG). Retrieved from https://www.fig.net/resources/proceedings/fig_proceedings/fig2016/papers/ts08c/TS08C

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_taiwo_daramola_et_al_8035.pdf

Taiwo, I. O., Mwesigye, S., & Buxton, C. (2021). Strengthening Land Rights in Pader District, Uganda with the Volunteer Community Surveyor Program. *Smart Surveyors for Land and Water Management - Challenges in a New Reality: Sustainability, Land Tenure and Land Administration*. Retrieved from

https://www.fig.net/resources/proceedings/fig_proceedings/fig2021/papers/ts07.5/TS07.5

_taiwo_mwesigye_et_al_11113.pdf

Wassie, Y. A., Koeva, M. N., Bennett, R. M., Lemmen, C. H. J., Koeva, M. N., Bennett, R. M., & Lemmen, C. H. J. A. (2017). A procedure for semi-automated cadastral boundary feature extraction from high-resolution satellite imagery. *Journal of Spatial Science*, 8596(July), 1–18. <https://doi.org/10.1080/14498596.2017.1345667>

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