Satellite Positioning (GPS) in Customary Land Boundary Demarcation in Peri-Urban Ghana
Case Study: Ejisu Paramount Stool land

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SUMMARY
Surveying and mapping, which is the backbone of construction and the foundation of governmental policy implementation, provides all the necessary data and information concerning land policies.
In Ghana, the classical method of land surveying and data collection (using compass and tape measurements) has suffered a number of setbacks such as human errors, time consuming, and cost prohibitive. A new method of using the satellite or the Global Positioning System (GPS) technology has been explored.

Parcels of land owned by families and chiefs in Ghana are usually without proper artificial boundaries and documentation. Few parcels with surveyed pillars are lost over the years as a result of activities such as farming and construction. This has resulted in customary lands management problems often leading to serious land disputes and conflicts among natives who share common boundaries.

The customary land boundary was identified and demarcated by the local people who share a common boundary. Survey pillars were planted at some selected positions.

With the application of this modern techniques (satellite positioning), the positions of the customary land boundary owned by the Ejisu paramount stool were observed. The data was processed and integrated into the new National Geodetic Reference Network (GRN). This has been documented for successful land administrative purposes both at the National and the District level. At the completion of the project, it has been proven to the concerned population that it is futile to shift or destroy boundary markers of any kind or quality. Any such manipulation shall be easily detected and rectified.

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1. INTRODUCTION

Customary lands have been in existence throughout history. In Ghana, Customary lands are lands owned by stools, skins, clans, families, etc. Customary lands form about 80% of the lands in the country. The remaining 20% is individual and state land compulsorily acquired or occupied over the years in pursuit of the State's development objectives (Larbi 2006). Customary land "ownership" refers to the communal possession of rights to use and allocate land by a group sharing the same cultural identity (Mattingly et al, 2006). Land ownership, in Ghana, has its origin in absolute "allodial" or permanent title, from which all other lesser titles on customary land take their roots -that persons other than the owners may have subsidiary or secondary rights, less than rights of ownership, in customary land; and that the rights of persons in customary land are derived from and determined by rules of customs of the area in which the land is located and which are expound by chiefs and elders but which are normally not written down or officially recorded (Paterson, D.E, 2001).

Customary lands support the daily living of the majority of the people in the country and they will be insecure the moment it is affected by disputes. The 1992 Constitution of Ghana recognizes the right of the traditional authorities to manage customary lands. Article 267 (1) of the 1992 Constitution states "*All stool lands in Ghana shall vest in the appropriate stool on behalf of, and in trust for the subjects of the stool in accordance with customary law and usage*."

Meanwhile, most of the customary lands have lost their boundaries because the landmarks and features (e.g. trees, rivers, footpaths, etc), which were used as boundaries, are lost after long period. Its immediate management, through an improved Land Administration Programme (LAP) is therefore critical to the socio-economic development of the country.

Sustainability of tenure of lesser titles would largely be improved or guaranteed if boundaries of customary lands are clearly defined in the field followed by a proper documentation.

2.0 APPROACH TO THE PROJECT.

2.1 Public Education

A series of public awareness campaigns were organized with the LAP officials to educate all the key stakeholders; chiefs, elders, Town development Committee, etc. (Figure 1).

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Fig.1 shows the meetings with the stakeholders during the public campaign.

The campaign was organized to meet the following specific objectives:

- **a)** To educate the people that, the boundary between the paramount stool areas and the adjoining paramount stools needs to be clearly defined in the field for easy identification.
- **b)** To provide credible documents, including co-ordinates, with a detailed description of the boundary, for which the chiefs' will give their firm undertaking to accept its location.
- **c)** To gain appreciation for the benefits that the existence of clear boundaries would bring to the present and future generations and the need to maintain them.
- **d)** To convince the concerned population by word and proof that, thanks to modern techniques (satellite positioning), it is futile to shift or destroy boundary markers of any kind or quality. (LAPU, 2008).

Materials such as Site layouts, photomaps and every information that were necessary for the education were obtained from relevant agencies such as the district offices and recognized bodies including the chiefs, elders and caretakers as shown in Figure 2.

Fig. 2 The survey team studying the topographical map for the area.

2.2 Field work

In the execution of the project, labourers were hired from the adjoining communities as a gesture. This was to give employment to the communities so as to get them to develop interest in the project, and also to make the knowledge of the existence of the boundary pillars known to them, (figure 3).

Fig.3 a) Survey Pillar planted insitu.

a. Reconnaissance Survey

Reconnaissance survey of the boundaries was undertaken with the approval of the chiefs, elders and opinion leaders. This is one of the most important aspects of any survey and must always be undertaken before any angles or lengths are measured, (Uren & Price, 1994). With the assistance of the chiefs' representatives, elders and opinion leaders from interested parties we arrived at a common boundary.

The process was run to meet the acceptance of the paramount chiefs.

The two types of boundary identified during the reconnaissance survey were:

a) Imaginary line herein referred to as Defined boundary (Db) and
b) Natural feature such as river, stream, and Forest Edge.

The boundaries (Db or Rb) were identified by the Representatives from the Adjoining Paramount Stools (RAPS). Once the RAPS had agreed upon the common boundary, a survey station was selected and the preparatory demarcation work begun.

The reconnaissance survey of the boundary (Db) which was carried out involved putting in pegs at some selected stations at intervals ranging between 0-1km based on the nature of the boundary as indicated by the RAPS. The surveying team made it a point to be always on the field with the RAPS.

b. Field Observations

Two teams, comprising six and eight people were created. Each team is made up of a representative of the chiefs from the towns owning the adjoining lands. The first team was trained by a technical team to use Geographic Positioning System (GPS) equipment and surveying techniques. The second team was used as an advance party in clearing the boundary

line at 2m wide, whiles planting the pillars at the selected stations during the reconnaissance. Where the line was hitting an economic tree such as cocoa or timber, the tree was avoided and not cut down.

The survey pillars (beacons) were of dimensions 22.9cm x 22.9cm x 45.7cm, of which 15.2cm was above the ground. They were used where the boundary had been defined by streams and rivers, (figure 4).

Fig. 4 Precast survey pillars that was planted along the course of the river Banko

The people were trained to use a handheld GPS to Map and detail the stream and its tributaries. Even though the accuracy in using the handheld was +/-3m, the wide of the stream on the average was 5m. It was also faster and a large volume of data was captured in no time compared to the classical method. No boundary monuments were planted for the Rb except the survey pillars and markers 'n'tombe' was erected to indicate the course of all the streams. This will ensured no boundary disputed whenever the river course is changed through artificial or natural means.

A boundary monument of dimension 30 x 30 cm with 1.1m above ground level and 0.46m below the ground were planted at where the boundary happened to be on the dry land (figure 4). At the various transitions points in between monuments, boundary markers (n'tombe) were planted to help define the boundary. These local trees were recommended by the chiefs and the indigenous people. The teams were maintained through the duration of the project.

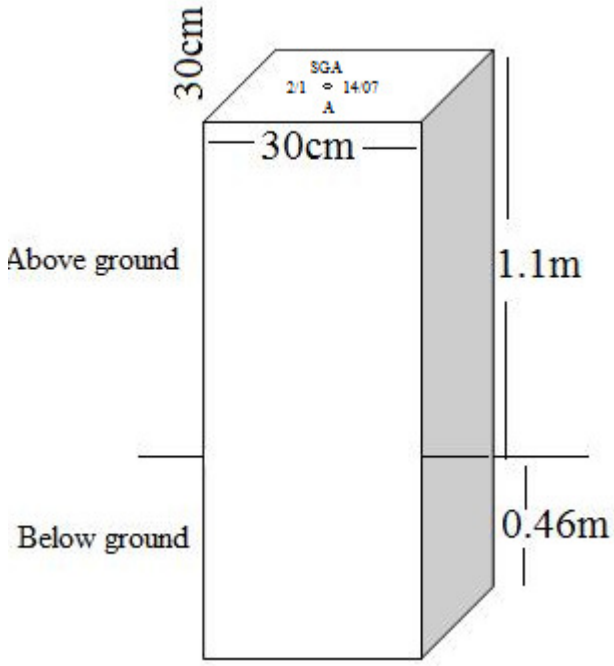

Fig.4 A typical boundary monument that was planted.

GPS observations were applied to coordinate all the survey pillars together with the boundary monuments. Where GPS observation was not possible due to canopy, the traverse was measured from the closest two GPS points. All the survey pillars were erected to conform to standards and recommendations with the relevant inscriptions.

C. Detailing

Permanent features like roads and the railway lines that cross the boundary at some points were detail and plotted on the plan as well. Also structures like houses that are so close to the boundaries were detail. All the farms that lie along the boundaries were captured and the names of the owners were recorded on the field books. The farmers who live along the boundary were supposed to serve as watch dogs.

3.0 RESULTS:

The GPS data observed was processed using software's like Trimble Total control and Survey spectrum. The data was integrated into the new National Geodetic Reference Network (GRN), after which a map was generated in Autodesk land desktop. The data was imported into ArcMap for the needed spatial analysis and a database was created. A small scale map at 1:50,000 was plotted. The positions of all the boundary markers of all kinds were also noted in the field books as well as on map (figure 5). The data below shows an example of the handheld GPS data that was captured for the Banko River and its tributaries.

Table 1. Processed GPS data from the handheld

P	Easting(m)	Northern(m)
1	672749	714782
2	683820	725873
3	683849	725854
4	683849	725845
5	683861	725840
6	683871	725835
7	683880	725830
8	683886	725824
9	683893	725816
10	683899	725807
11	683907	725801
12	683916	725798
13	683926	725794
14	683930	725786
15	683923	725779
16	683915	725772
17	683908	725765
18	683900	725759
19	683899	725757
20	683779	725061

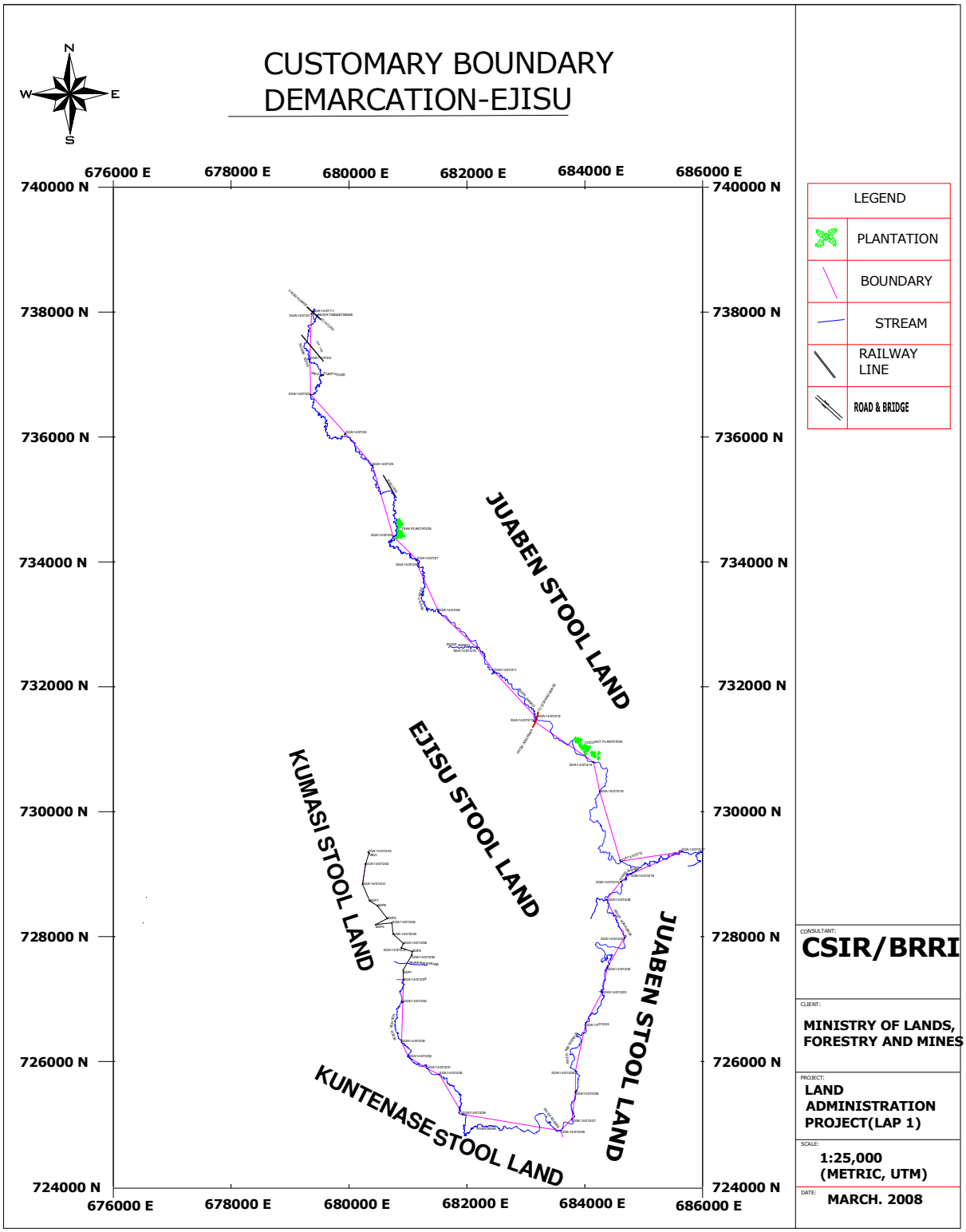

Fig.5 the boundary after phase 1 for the Ejisu Paramount Stool land.

4.0 DISCUSSIONS:

4.1 Customary boundary Demarcation:

With the help of the GPS technique, all the positions of the boundary pillars were fixed irrespective of time of the day, weather, position etc. The river corridor was also capture with the handheld GPS. All the individual farms along the boundary were captured by the GPS and their positions indicated in the final drawings. Apart from the accuracy in using this equipment, the people appreciated the fact that it is very easy to use and more time efficient than using the Topographical Maps and recording information by hand. It is also futile to shift or destroy boundary markers of any kind or quality.

4.2 The Rural Household

Throughout the project period, it was realised that despite continuing urbanisation, larger percentage of the populace in the country still live in rural areas. No matter how poor a household, it has an equal share of rights, or are co-owners in the customary land system. This implies that, the rural household incomes are derived mainly from the land tenure system. The people accepted that, the existence of clear boundaries would benefit the present and future generations and so the need to maintain them.

4.2 The government

The State needs the system to be nationally uniform and sustainable; a basis for implementing local taxation, land use and building control and for the provision of infrastructure eg. the Inland port and the Free Zone.

5.0 BENEFITS/ PROGRESS

Identification of the customary boundary will contribute to economic development and sustainable livelihoods by strengthening rights in the customary lands by removing uncertainty (disputes) especially with those that they share common boundary, and by encouraging:

a. actions by rural households to: increase production of agricultural goods; lease, rent and share crop land; manage and use natural resources for household provisioning (food and fuel), medicinal plants, craft production, building; invest in local economic development via small enterprises; participate in development projects jointly with private investors; adopt peaceful and legal means for resolving land related disputes rather than resort to land invasion and violence(Adams et al ,1999);

b. actions by government at different levels to: provide infrastructure and services, and invest in development projects, particularly housing; and, on the understanding that the investment is secure.

c. actions by the private sector to: invest in eco-tourism, forestry and agricultural projects as there is the assurance that they will not be evicted without compensation, their children can inherit the property; the ability to sell or otherwise transfer the property; the ability to borrow money using the property as collateral; properties to be serviced with such things as water,

electricity and the upgrading of roads; and an inexpensive and easily accessible system of administering property rights.

6.0 CONCLUSIONS:

Composite plans showing boundaries of adjoining stool lands have been submitted for validation and acceptance by the respective paramount councils at public forum? Where there were changes during deliberations, they were effected accordingly especially the tributaries where the river/stream is the boundary.
A draft report was also submitted for discussion, after which the final drawings together with all field notes and sketches with the approval of the Regional Surveyor have been submitted to the Client.

Recommendations
Policy-makers

- Need to think in terms of a long transition period from customary tenure to freehold title and how land will be administered during this time.
- A wider range of the public needs to get involved in debates about land.

The Ministry of Lands:

- Should recognise and engage with the institutions of customary tenure (Land registries) especially the Secretariat being set up by the LAP for the Traditional Councils (Decentralization).
- Should support the LAP in the process of Customary Boundary demarcation and be ready to administer the outcome.

The local Government:

- Can sensitise communities about the pros and cons of acquiring certificates of customary ownership. These should be issued to those who apply. The certificates need to become a 'living' document, amended as land is bought, and as people are born and die.
- Can set up a system for recording land transactions on 'customary' land through the Traditional Council's Secretariat.

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BIOGRAPHICAL NOTES
Primary Speaker (Joseph Owusu)

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