

## **Parcel Identification System of CSA, Land Area Measurement and Problems Attached *CSA's Experience***

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### **1. Background**

The Central Statistical Agency (CSA) is the sole producer of socio-economic and demographic data. As part of its main task, since 1980/81, CSA has been collecting, processing and disseminating key agricultural data at different reporting levels. Among the main agricultural data produced is area under different land uses (i.e., area under crop, area under fallow, area under grazing, etc.) for private peasant holdings, which constitute over 90 percent of the total land area, and for large and medium scale commercial farms. How is a particular parcel/field identified in CSA's field work? Regarding information on size of holding/parcel/field, what method does CSA apply to collect data on size of holding/parcel/field? How does this method facilitate the collection, processing and compilation of data? What problems are encountered during data collection on area under different land uses? Why measure? Why not use local measurement units of area? Which part of CSA system can be an input to the *standardization of land registration and cadastral survey methodology*?

### **2. Objective**

Collecting data on size of area of land in this country entails many problems. However, for the last 27 years, CSA has been collecting data on area of farm land using both subjective and objective methods; it has also established a system which enables to identify a particular parcel/field within a holding in a given administrative boundary, i.e., Wereda/enumeration area. Therefore, for developing a cadastral survey methodology and standardization of registration of land, CSA's experience could be used as an input and serve as a stepping stone for the upcoming cadastral survey and land registration. Hence, the objective of this chapter is to briefly explain the established system of parcel identification and method of land area measurement in agricultural surveys conducted by CSA.

### **1. Parcel/Field Identification System of CSA**

#### **3.1 The Need for a Cadastral Survey**

Some of the main advantages of conducting a cadastral survey/ registration of rights of land include the following:

- It is an essential basis for understanding the agrarian situation in a country;
- It is relevant in the execution of any reform which involves change of existing rights in land, e.g., resettlement, consolidation of fragmented holdings, etc.;

- It facilitates the operations of any scheme for the supply of agricultural credit, especially to small farmers;
- It facilitates any agricultural development such as providing subsidies, credit, seed or fertilizer distribution, pest control, plant protection, etc.
- It facilitates the application of all sampling methods in statistical research related to land.

In Ethiopia, however, a full fledged cadastral survey and/or registration of rights of land has not been conducted for different reasons. In the absence of a proper cadastral survey and/or land maps, the CSA uses the Population and Housing Census Cartographic Maps of Enumeration Areas, for the various rural and urban socio-economic surveys, including agricultural sample surveys which involve measurement of land under different categories. These enumeration area maps facilitate during the survey the sampling scheme, field work, and above all are an instrument to control or avoid omissions and duplications of localities and/or households.

### **3.2 Concepts and Definitions**

Data items and technical terminologies used during a survey have to be distinctly defined and identified. Standard concepts and definitions used in the survey help to maintain consistent enumeration and measurement of variables of interest. The concepts and definitions used in the all-agricultural sample surveys and censuses conducted by the CSA are made to confirm to the FAO standard, with a slight adaptation of a few of them to suit the agricultural situation in Ethiopia. Some of the main concepts and definitions used are the following.

**Enumeration Area:** is a locality that is in most cases less than and only in some cases equal to a Peasant Association in geographic area and usually consists of 150-200 households (for rural) and 200-250 households (for urban).

**Households:** A household may be either:

- a) a single-person household, that is a person who makes provision for his own food or other essentials for living without combining with any other person to form part of a multiple-person household, or
- b) a multiple-person household, that is, a group of two or more persons who live together and make common provision for food or other essentials for living. The persons in the group may pool their incomes and have a common budget more or less. They may be related or unrelated persons, or a combination of both.

**Agricultural Household:** A household is considered an agricultural household when at least one member of the household is engaged in growing crops and/or breeding and raising livestock in private or in partnership with others.

**Agricultural Holder:** A holder is a person who exercises management control over the operations of the agricultural holdings and makes the major decisions regarding the utilization of the available resources. He has technical and economic responsibility for the holding. He may operate the holding directly as an owner or as a manager. Using the terminology of a traditional agricultural holding the holder may be regarded as the person, who with or without help of others, operates land or raises livestock for his, i.e., the person who decides on what, when, where and how to grow crops and/or raise livestock and has the right to determine the utilization of the products.

**Agricultural Holding:** A holding is all the land and livestock kept which is used wholly or partially for agricultural production and is operated as one administratively managed unit by one person alone, or with others, without regard to title, legal form, size or location. A holding may consist of one or more parcels.

**Parcel:** A parcel is a portion of land belonging to the holding, which is any piece of land entirely, surrounded by land, water, road, forest, etc., which are not parts of the holding. It may consist of one or more cadastral units, plots or fields adjacent to each other.

**Field:** A field is defined as any plot of land within a parcel, which can be the whole or part of a parcel under the same agricultural practice.

### 3.3. Scope and Coverage of the CSA's Sample Surveys

In Ethiopia, statistical summary results show that there are over 10 million agricultural households (table 1). Given the limited resources (financial and human), and time and the enormity of data items to be collected and above all close linkage of agriculture variables with the different agricultural seasons it is not feasible to collect agricultural data annually on complete enumeration basis, hence, sample surveys are highly recommended.

Table 1. Rural private peasant holding

No.	Items	Total number	Sample coverage	
			Number	Percent
1.	Enumeration areas	50 thousands	2500	5
2.	Agricultural households	10 million	75000	1
3.	Agricultural holder	10.4 million	7500	1
4.	Parcels	30 million	225,000	0.75
5.	Fields /other land uses	104 million	900,000	0.87

Source: CSA 2004/05 Agricultural Sample Survey.

### 3.4 Identification of a Parcel/Field within an Agricultural Holding

To facilitate data collection, processing and compilation, CSA employs a numerical coding system. Every unit of land (parcel or field) listed or recorded during an agricultural survey has to have a unique identifier within a holding. For a geographic area, at national level, it attaches a unique code to each region. Then within each region a two-digit consecutive number is attached to each zone. Similarly, within each zone, a two-digit consecutive number is attached to each Wereda. A similar approach is applied to Peasant Associations (within a Wereda) and Enumeration Areas (within a Peasant's Association).

In each sampled enumeration area, a complete and fresh list of households (agricultural and non-agricultural) within the Enumeration Area (EA) is carried out every year by canvassing the households in the EA. After a complete listing of the households and screening of the agricultural households during the listing operation in the sampled EA, the agricultural households are serially numbered. Each of the serial numbers attached to each agricultural household will be used as an ID number to the corresponding household. On the other hand, to each holder/holding within the selected agricultural household, two-digit numbers starting from 01 will be assigned, which will later be used to identify a holder/holding within an agricultural household. In a similar fashion, a two-digit number will be given to each parcel within a holding/holder and also to each field/other land uses within a parcel. An illustration of the holding/parcel/field identification system used by CSA is presented below.

<b>REGION</b>	----- 01, 02, 03,.....14	_____	(fixed)
<b>ZONE</b>	-----01, 02, 03,....	_____	(fixed)
<b>WEREDA</b>	-----01, 02, .....	_____	(fixed)
<b>PA</b>	-----001, 002, ....	_____	(fixed)
<b>EA</b>	-----01, 02, .....	_____	(fixed)
<b>HH</b>	-----001, 002, ....	_____	(not fixed)
<b>HOLDING</b>	-----01, 02, .....	_____	(not fixed)
<b>PARCEL</b>	-----01, 02, ...	_____	(not fixed)
<b>FIELD</b>	-----01, 02, ...	_____	(not fixed)

As indicated above, for an agricultural survey, two sets of numbers which could help identify a particular land use (parcel/field) is assigned at different stages. The first set is fixed, with five categories of two-digit numbers which are assigned at the head office level, i.e., for Regions, Zones, Weredas, Peasant Associations and Enumeration Areas. The second set is for four categories assigned by field workers during a listing of households and different land-uses within an EA, which includes Households, Holdings, Parcels and Fields. Note that for the geographic hierarchy (Region, Zone, Wereda, PA, and EA), a code book has been prepared and documented to be used by field and data processing personnel.

**Practical Example:**

Amhara_____	03
S/Gondar_____	01
Janamra_____	04
Inchet Kab_____	007
EA_____	01, 02, 03, 04, 05

**4. Methods of Data Collection on Size of Land Area and Related Problems**

There are two major conventional methods of collecting data/information on the area of a parcel or a field, i.e., subjective (ground survey) and objective (air and ground survey) methods.

**4.1 Subjective Method**

Information on size of area of a holding or a parcel or a field could be collected from the legitimate respondents through interviews. This method has its advantages and disadvantages. In most cases, this method is simpler, cheaper and faster and does not require highly trained personnel as compared to the objective method. However, in Ethiopia where the majority of the rural population do not have much acquaintance with standard measurement units (such as hectare, square meter, etc.) data collected subjectively on size of area of a parcel or a field has various drawbacks. These include:

- Almost all rural peasant holders do not know the size of the different parcels they have in hectares or square meters and hence, they could only provide in local area measurement units such as *timad*, *boy*, *kert*, *senga*, etc.;
- The number of local measurement units in the country is too many (over 80), and hence difficult to manage;
- A particular local area measurement unit such as *timad*, though the same in name, is significantly different in size from Wereda to Wereda and from zone to zone;
- Also factors related to the characteristics of respondents such as age and literacy status could contribute to the differences and/or to the precision of the data collected;
- Also, the size of area expressed in *timad*, *kert*, *senga*, etc., depends on factors such as topography, weather, type of soil, hours of work, stamina of oxen, age of farmer, etc.
- Above all, there is no standard conversion coefficient to be used for converting the local area measurements into metric equivalents.

Using the 2001/02 Ethiopian Agricultural Sample Enumeration data, CSA made an in-depth analysis to establish standard conversion coefficients for Oromia Region, using the

first three most frequent local area measurement units, and the result is presented below, at zone level for *timad*. (*Timad* is the size of an area that can be ploughed by a pair of oxen during a day's work.)

One can easily observe from table 2 how the size of *timad* varies in the different zones of Oromia Region. Similarly, differences are also observed in different Weredas within a zone. Therefore, an acceptable conversion coefficient should be established for groups of Weredas within a Zone.

Table 2. Conversion coefficients for *timad* in Oromia Region

Zone	Code	Equivalent of a <i>timad</i> in sq. meters	Equivalent of a <i>timad</i> in hectares
Mirab Wellega	01	1100	9.1
Misrak Wellega	02	1416	7.1
Illubabor	03	1156	8.6
Jimma	04	998	10.0
Mirab Shewa	05	1489	6.7
Semen Shewa	06	1548	6.4
Misrak Shewa	07	2392	4.2
Arsi	08	2301	4.3
Mirab Hararghe	09	-	-
Misrak Hararghe	10	-	-
Bale	11	1734	5.8
Borena	12	1116	9.0
Guji	13	-	-

To make available the required conversion coefficients, a special survey of local measurement units which will complement the 2001/02 Ethiopian Agricultural Sample Enumeration (EASE) of CSA has to be conducted. Along this activity, CSA has to make a progress in finalizing the construction of the local area measurement conversion coefficients for zones and/or groups of Weredas.

Table 3. Standard conversions of local units of area for Oromia Region (by Group of Weredas)

Zone	Total no. of Weredas	Local area unit	No. of obser.	Cluster Weredas				Area in Sq meter/ Local area unit	Standard Error (S.E.)	Explained Variation ( $R^2$ ) in %
				Groups	No. of Obser.	No. of Weredas	Wereda name			
West Wellega	20	Timad	27518	I	18054	10	Gidami, Anfilo, Ayra Guliso, Dale Sedi, Hawa welel, Lolo kile, Lalo Asabi, Ganji, Nole Kaba, Haru	1130.191	3.033	88.5
				II	6860	6	Mana Sibiu, Jimma Haro, Gawo Dale, Nejo, Gimbi, Boji	950.576	5.402	81.9
				III	2604	1	Sayo	1421.941	11.751	84.9

#### **4.2. Objective Measurement Method**


























The other alternative method available is objectively measuring a parcel or a field. Nowadays, there are quite a number of methods of measuring the area of a parcel, such as Satellite Image, GPS, Total Station, Compasses and Rope. Among these methods, the CSA, since 1981 has been applying the compass method although it is very expensive, time consuming as compared to the subjective method but much cheaper and feasible compared to the GPS or use of satellite image, in the Ethiopian condition. The format used by CSA for recording the measured parcel or field for a particular agricultural household/holder is shown in table 4. Using a programmable calculator or computer, the recorded bearings and corresponding side lengths will be used to calculate the size of a field/ other land uses in square meters or in hectares. Summing up all the calculated size of land uses of a specific holder will give an estimate of the total area size of the corresponding holding.

**Table 4: Formats Used by CSA to Collect Agricultural Sample Data**  
**Part I – Identification Particulars**

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Region	Zone	Wereda	Farmers' Association	E.A	Household ID	Household Head Sex M = 1 F = 2	Holder ID	Holder's			Educational Level Highest grade completed	Household Size	Holding type Crop = 1 Livestock = 2 Both = 3
								Name	Age	Sex M = 1 F = 2			

**Part II – Field Area Measurement**

1	2	3	4	5	6
Parcel number	Field number	Land use type	Code	Ownership type Owned = 1 Rented / leased = 2 Other = 3	Code

Measurement	Day	Month	Area in square meters					Closure error	
Side	1 - 2	2 - 3	3 -	4 -	5 -	6 -	7 -	8 -	
Bearing									
Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Side	9 -	10 -	11 -	12 -	13 -	14 -	15 -	16 -	
Bearing									
Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Side	17 -	18 -	19 -	20 -	21 -	22 -	23 -	24 -	
Bearing									
Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
If no area measurement, reason 									

## **5. Recommendations**

- i) Make thorough investigation on the various methodologies and techniques available;
- ii) Make pilot exercises applying the different approaches and methodologies at various sites;
- iii) Choose a feasible and simpler method based on the pilot results;
- iv) Prepare a standard and uniform procedure for the land registration and a cadastral survey methodology with full participation of appropriate personnel of all regions;
- v) Prepare workshops on the procedures and modalities for the appropriate Regional and Federal personnel and incorporate the comments and suggestions obtained from the workshop;
- vi) Prepare a standard format for land registration and cadastral survey, including area measurement procedures based on the selected methodology;
- vii) Establish systematic coding system of identification such as CSA's with some modification.

## **References**

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