



REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE—NATIONAL AGRICULTURAL LABORATORIES

KENYA SOIL SURVEY

COST ANALYSIS OF VARIOUS TYPES OF SOIL SURVEYS

by

D. W. Kilambya and A. Weeda

INTERNAL COMMUNICATION PAPER No. IC27, 1986

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INTRODUCTION

For planning purposes within the Kenya Soil Survey (KSS) and as part of an efficiency analysis, it is deemed necessary to realize what the levels of the cost factors are for the execution of the various soil surveys. To facilitate this a cost analysis has been made for the different types of soil surveys, which have been carried out recently by the Kenya Soil Survey in various parts of the country.

The types of soil surveys under consideration are the Reconnaissance, Semi-detailed and Detailed ones. The two other types of surveys, the Exploratory soil survey and the Site-evaluation, are not taken into account in the cost analysis for different reasons. The Exploratory soil survey for the whole country at a scale of 1:1,000,000 has been executed during the seventies and published in 1982, while the site evaluations have been left out of the analysis due to the rather varying nature of their goals and the varying specifications with which they are executed. For this reason, it is difficult to indicate in a generalized manner what the cost of each site-evaluation would be.

The cost analysis has considered those surveys which were carried out during the period 1981 to 1985. Sixteen surveys which have a reasonable amount of available data have been analyzed. However, it should be noted that not in all cases the data is consistent. In several cases estimates had to be made to complete the picture.

Staff members of the Kenya Soil Survey and the National Agricultural Laboratories were interviewed to obtain additional data. Their cooperation is highly appreciated.

METHODOLOGY

The various types of soil surveys are differentiated according to their degree of detail or scale which they require:

reconnaissance	1:100,000 or 1:250,000
semi-detailed	1: 20,000 to 1: 50,000
detailed	larger than 1: 20,000.

The increasing degree of detail, associated with the required amount of man hours, has an inverse relationship with the amount of survey work

executed expressed in hectares, but a positive relationship with the cost per hectare. For each type of survey, a certain degree of generalization had to be made in order to exclude some extreme circumstances which might have prevailed during some of the surveys.

In order to be able to execute this cost analysis some assumptions, restrictions or estimates had to be made due to the fact that not all available data was complete nor had the required degree of detail. For practical reasons the cost factor has been divided into three main components:

- (a) survey costs
- (b) cost of equipment
- (c) overhead

For all these components of the cost analysis it has been considered useful to express the costs in KSh/ha. It has to be realized that no inflation corrections have been applied for prices of goods, salaries, nor for other costs over the period 1981-1985, but that the values of the goods or services at the date of commitment or expenditure have been taken as calculation figures.

(a) Survey costs

This main component has been divided into five phases related to the execution of each survey, for which the relevant criteria and observations are as follows:

1. Preparation of survey

Considered here are the costs of aerial photographs, labour inputs for the photo interpretation and some salary costs related directly with the organization of the fieldwork phase. The progress of aerial photo-interpretation per field group has been estimated to be as follows:

reconnaissance	5000 ha/day
semi-detailed	1000
detailed	200

The labour cost (salary of personnel involved during this phase) has been based on the salary level of an Agricultural Research Officer at 35880 KSh per

year.

2. Fieldwork

Included are proportional parts of salaries of the personnel involved, their allowances like subsistence and house allowance, fuel, casual labour, minor car repairs and some other minor costs, incurred during the work in the survey area. It has been assumed that there are 20 working days in a calendar month.

For the purpose of the cost calculation per hectare for each survey area, the funds required for travelling (including the proportional parts of salaries and allowances) have been excluded, such that the cost per hectare is not influenced by the distance to and from the survey area. If the total cost of a survey including the travel from Nairobi to and from the survey area will have to be known, calculations can be made on the basis of cost per hectare for the specific type of survey.

As basis for the travel calculation the assumptions made are indicated in table 1.

Table 1. Travel time for various distances

road distance	0 - 50 km required	0.25 journey day(s)
	50 - 200	0.50
	200 - 400	1.00
	400 - 600	1.50
	600 and more	2.00

To calculate the personnel cost involved during those travel days, the average composition of the group that is travelling, has been established and the proportional part of their salaries and allowances has been calculated over the mileage of the trip. For the fuel consumption of a Landrover the figure of one litre per 4 km has been taken. This also caters for some additional costs like oil.

In some extreme cases an adjustment towards the "Standards for soil surveys in Kenya" (Siderius, 1980) had to be made for the density of observations in the fieldwork area in order to obtain a rather uniform basis for the cost comparison.

3. Laboratory analysis

The soil samples taken during the fieldwork are analysed at the laboratories of the National Agricultural Laboratories for which service the official prices were calculated and included in the cost analysis.

4. Report writing

The costs of the staff member's time involved in this phase, includes those of the author(s), editor(s) and typist(s).

As the progress during the write-up is too variable depending on the skill of the author, it was decided to use the following minimum assumptions:

reconnaissance	scale 1:250,000	5000 ha/day
	1:100,000	1200
semi-detailed	1: 50,000	200
detailed	L: 10,000	5

5. Cartography and reproduction

All costs for labour and materials for the drawing of maps and figures, as well as the reproduction costs of the whole publication including the (coloured) maps, are taken into account.

In general good records of data were available for the fieldwork and laboratory phases. For the other figures the authors frequently had to make estimations and adjustments on the basis of interviews and observations.

(b) Cost of equipment

The second component is the replacement value or depreciation value of the materials or equipment used other than consumables, during the whole process upto the finishing touch of the publication.

in order to relate the cost of equipment to the surveyed hectares, the time during which the equipment was used for fieldwork has to be calculated. At first the total areas of the different types of executed surveys during the observation period have been compiled. Taking inot account the rate of progress obtained, the relative distribution of the time component during which the equipment was used by the specific type of survey was obtained.

As some types of equipment are not only used in the three types of surveys mentioned, but are also used with other activities, a modest percentage of the cost factor is attributed to the last ones, together with the one for the site-evaluations.

The total cost of this component has been distributed proportionally over the various surveys, based on the calculated relative distribution of time. Nearly all the costs mentioned under this component are considered as depreciation value. The total value of the equipment was obtained by adding up the expenditures of the Kenyan Government and of the Dutch technical assistance only for the directly survey-related expenditure. This means that costs involving training, conferences, evaluation missions etc. are excluded from the cost-analysis.

(c) Overhead

A fixed percentage of 15% has been calculated over the two components, survey costs and cost of equipment.

RESULTS AND CONCLUSIONS

The costs of the differentiated phases per type of soil survey, in Ksh per hectare, are given in table 2.

Table 2. Average cost for the various survey-phases (in KSh/ha)

type of survey	reconnaissance		semi-detailed		detailed	
	Ksh	%	Ksh	%	Ksh	%
phase						
preparation	.10	4.5	.20	.5	1.00	.3
fieldwork	1.50	68.0	25.60	75.0	220.00	75.0
Laboratory analysis	.10	4.5	6.00	18.5	22.50	7.6
report writing	.20	9.0	1.00	3.0	40.00	13.6
cartography/reprod.	.30	14.0	1.00	3.0	10.50	
total	2.20	100	34.20	100	294.00	100

From table 2 it can be seen that the cost of the fieldwork is between 68 and 75% of the costs for the survey component. Also there is a remarkable difference in cost per hectare for the various soil surveys: the more detailed the survey, the more cost-intensive it is.

For the cost of equipment component the relative time-distribution over the types of surveys, as percentage of the total time, is the following:

reconnaissance	50%
semi-detailed	15
detailed	15
site-evaluation/other	20.

The total expenditures for the relevant votes has been related to the areas surveyed, and are given in table 3 together with the two other components.

Table 3. Total soil survey costs in Ksh/ha.

Survey type of	R	S	D
Survey costs	2.20	34.20	294.00
Equipment	2.10	30.30	606.00
Overhead	0.70	9.70	135.00
total	5.00	74.20	1035.00

From the overall cost shown in table 3 it can be observed that the detailed surveys involve the highest costs. Thus care must be exercised when considering areas to be surveyed at this level of detail.

Additionally to the figures of table 3, to be included are the costs of travel to and from the survey area during the period of the fieldwork. The calculations give the following results:

personnel	3 Ksh/km
petrol, etc	2 Ksh/km
total	5 Ksh/km

It must be noted that the data resulting from these calculations are given as averages, and do not give exact figures for the individual soil survey which might vary. This variation might be a reflection of the different degrees of human and environmental limitations or constraints, such as efficiency of surveyors, accessibility, or weather conditions.