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Land Suitability Evaluation for Sustainable Food Security in Kiryandongo Refugee Settlement, Uganda

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Research Article

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ABSTRACT

Realizing sustainable livelihood and food security in refugee situations is often an overwhelming challenge. The focus of this study was on ensuring food self-reliance in Kiryandongo refugee settlement in Uganda. The study employed a multi-method approach, that is both qualitative and quantitative methods were used. A cross sectional survey design was used and primary data was collected using questionnaires and in-depth interview. Experimental method was used in analyzing soil samples for soil organic matter content, soil moisture and soil depth. Suitability classes were derived for each of the assessed variables separately and a generalized suitability was later obtained. Suitability classes were ranked as S_1 (highly suitable), S_2 (moderately suitable) and S_3 (marginally suitable). Each sampling unit was chosen on the basis of soil colour, slope and soil type and crop history. Each sampling unit was captured by the use of GPS and results interpolated to depict the situation and mapping of the entire refugee settlement. The results indicate that areas of high suitability S_1 devoted for maize yielded a production level and would ensure food security. Using mean comparative test for average yields, the study established that there was a strong relationship between maize production and land suitability. Areas of marginal suitability experienced the threat of food insecurity. The study recognized the relevance of land suitability evaluation for planning purposes and in ensuring that land resources are put to maximum use. The study recommended site selection for refugee settlements to undertake land suitability evaluation prior to any allocation for settlement.

Keywords: Food security, Refugees, Land suitability evaluation.

INTRODUCTION

People involved in involuntary migration may be forced as a result of circumstances beyond their control to cross an international boundary into another country as refugees. Africa is one of the major refugee generating and hosting continents in the world, sheltering more than 5 million and at least half of the world's refugee population (Gingyera 1998). Realizing sustainable livelihood and food security in refugee situations is often an overwhelming challenge. The self-reliance model emphasized in refugee settlements in Uganda focuses on food production as the only facet. It is assumed that ensuring food security in refugee situation will equally help in the realization of other non-food needs. However, in allocating land for refugee settlement, an inventory of the land resources, particularly for crop production is never carried out.

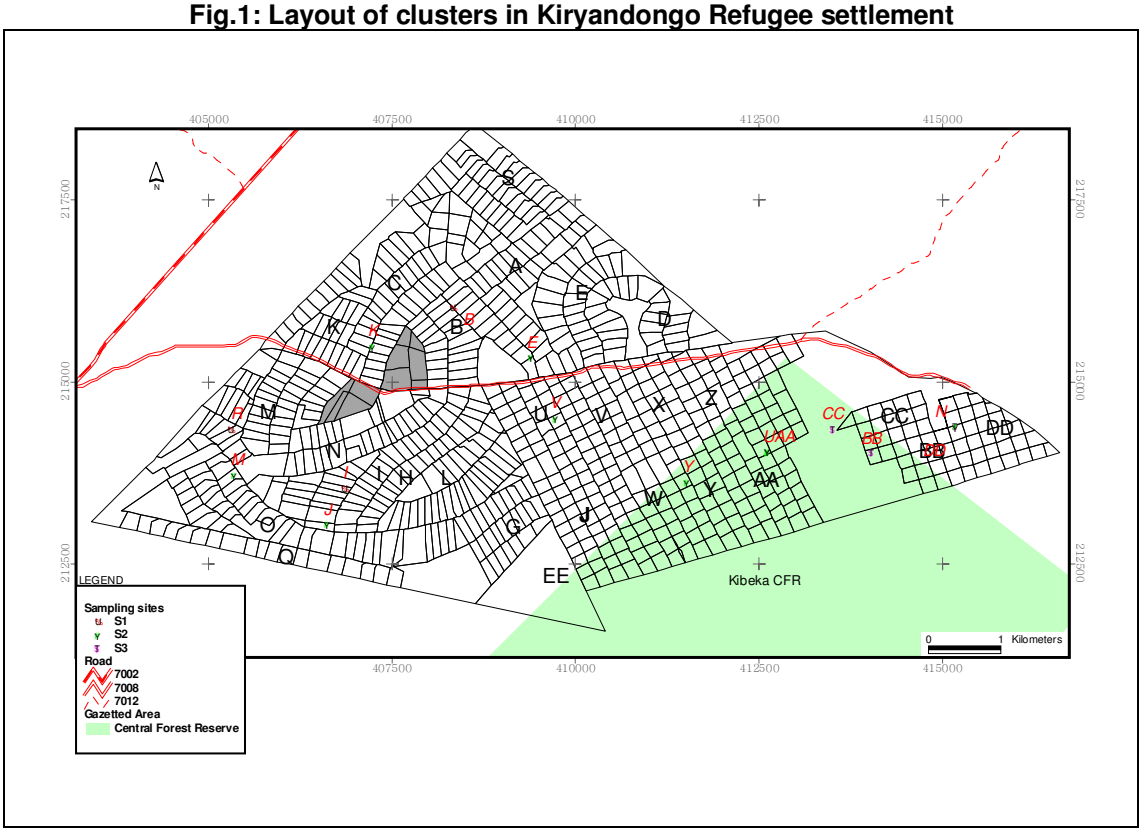
Kiryandongo Refugee Settlement is located within the rangelands in Uganda; which form what is known as the "cattle corridor". These areas are characterized by erratic and low rainfall, severe drought annually or after every few year, low vegetation cover and fragile soils which may be having low productivity levels. While the establishment of the settlement was geared towards the refugees achieving self-sufficiency in food production, there was virtually no prior assessment of the carrying capacity of the land resources and suitability of the area for crop production. With growing population in the settlement, raising and sustaining the production of land is a formidable problem, presenting almost intractable technical challenges. In addition, the land available is becoming smaller with increase in population, reduced fallow period, and as a result crop production in the settlement has not grown to keep pace with the demand for food. The resultant environmental degradation and alteration of the stability of the ecosystem poses a major challenge for sustainable use of land for cultivation and greatly affecting the productivity of the land. This ultimately will lead to food insecurity in the refugee settlement. The overall goal of the study was to assess the

potential of land resources to support a particular Land Utilization Type (LUT) for sustainable arable farming, with the view of ensuring sustainable food security.

Back ground of the study Area

Kiryandongo Refugee Resettlement is located in Kibanda county, Kiryandongo district in Mid-Western Uganda. The District receives an annual rainfall of 1200 mm on average. It has two main growing seasons; March to May, referred to as the first rainy season and August to November, which is the second rainy season (District environment profile 1997). Kibanda County has a favourable climate and its rainfall pattern is bimodal. The county receives an annual average rainfall of 1000mm per annum (2002 statistical abstract-UBOS and 2002 Annual Rainfall Report Meteorological Department–Masindi). Figure 1 represents Kiryandongo refugee camp with all the settlement clusters.

Fig.1: Layout of clusters in Kiryandongo Refugee settlement



Research design

The methodology employed was multi-method approach where both quantitative and quantitative research methodologies were used (Gillham, 2000).

Sample selection

Using Krejcie and Morgan (1970) table for sample size determination, a total of 133 respondents were selected and the basic unit of study and analysis was the household. This is partly because the household is taken as the smallest economic unit in which resources are shared and managed (Holzmann et al, 2008), and partly because the household, particularly in developing countries, often functions as the basic decision-making unit. The refugees are resettled in the ranches of 1, 18 and 37 which are further sub-divided into clusters. Proportion sampling was used to determine the proportion of population as follows. Using population size proportionality of 40% (n=53/133), 33% (n=44/133) and 27% (n=36/133) for ranches 1, 37 and 18 respectively. Questionnaires were administered to refugees at household level, in-depth interviews to 10 settlement officials and the implementing agency staff (ICRC) and 2 Focus Group Discussion of 10 members each of Refugee Welfare Committee officials . The information

targeted was mainly to determine the level of food production, land productivity and to establish the status of food security among the refugee population. Table 1 shows how the sample population was represented from each of the ranches in the refugee settlement.

Table 1.0 Sample size

Location	Total Number of respondents
Ranch 1	52
Ranch 37	44
Ranch 18	36
Total	133

Soil sampling

Soil sample analysis was done to determine the fertility of the soils and how much crop yield it can sustain. Composite soil samples were taken from 18 sites in the settlement. Soil samples were extracted using a soil auger and mixed thoroughly in a plastic bucket to obtain a representative sample (composition). The sites sampled were selected at random for each sampling units and selected at a depth of 0-15cm where sub-soils are important store of nutrient and water. The samples were analyzed for moisture content, organic matter, nitrogen, potassium and phosphorus. Each sampling unit's spatial location was captured using Global Position System (GPS) equipment for mapping the final suitability's.

Soil profile (depth) was carried out to determine the depth of the topsoil and also provide vital information for suitability analysis for rooting depth of crops. Soil profile study was done by digging about 1.5m deep profile pit at selected sites. Suitability rankings for organic matter are presented in Table 2.

Table 2.0 Suitability ranking for soil nutrient level

Range	Suitability	Class
≤3.0%	Poor	S_3
3.1-5.0%	Moderate	S_2
≥5.1%	Very good	S_1

Table 3 shows how suitability based on moisture content was determined.

Table 3.0 Suitability ranking for moisture content

Amount of soil moisture content (%)	*Grade*	*Suitability*
≤15%	Poor	S_3
15-20%	Moderate	S_2
20%	Good	S_1

Table 4 shows how suitability rankings for soil depth were determined.

Table 4.0 suitability raking for soil depth

Depth (cm)	*Grade*	*Suitability*
0-15	Poor	S_3
15.1-19.0	Moderation	S_2
20+	Good	S_1

Procedure in suitability analysis

This was done by; description of major land utilization types, determining Land Use Requirements for each of the respective LUTs and determining land qualities. Finally, matching LURs with LQs was done to obtain overall land suitability.

Suitability classes were defined considering the value of capability index and the classes included:

S1 (Highly suitable) - land which has no significant or only minor limitations for crop cultivation.
S2 (Moderate suitability) - land which has limitations that are moderately severe for sustained crop production.
S3 (Marginal suitability) - land which has severe limitation for crop production.

RESULTS AND DISCUSSIONS

The main land use was crop cultivation and the major crops grown include maize, cassava and sorghum. Maize is the main staple food in the settlement. There are two growing seasons, with the long rain season in March to April and short rain season from August to October. Table 5 represents the major crops that are grown in the refugee settlement in order of importance.

Table 5.0 Major crops grown

Crops	Frequency	Percent (%)
Maize	118	88.7
Beans	6	4.5
Sorghum	4	3.0
Cassava	2	1.5
Others	3	2.3
Total	**133**	**100.0**

Maize is the major crop grown in the settlement and up to 88.7% of the refugees grow maize. This is partly because the region is a major maize growing area with the host community growing maize as a major crop. Maize here is largely grown on subsistence basis for human consumption and where surplus is realized it's traded for other non-food items.

Suitability of land for crop cultivation in the Refugee Settlement

The study revealed that 16.6% of the area in the settlement had soils of high suitability in organic matter content. 72.2% of the soils were of moderate suitability which only 11.1% of the areas had soil of marginal suitability.

Soil moisture content

The study revealed that soil moisture content is generally adequate for plant growth. 27.7% of the soils of the settlement have areas of high suitability in relation to soil moisture content with 72.2% having moderate suitability. This therefore, means that moisture required for plant growth is basically adequate. However, productivity of land is influenced by a multiplicity of factors. When moisture is excessive, it contributes negatively to productivity, for example, an area in cluster V and U during rainy season become marshy. The marshy condition is attributed to poor drainage.

Soil depth

An estimated 22.2% of the settlement comprised soils of good depth. This soil was considered suitable for crop growth because it enables plant roots penetrate deep and make use of soil nutrients. Areas with deep soil are usually fertile because sub-soils are important stores of nutrients and water. 27.8% of the settlement has poor soil depth; the areas are rocky with thin, shallow soils and therefore unable to sustain significant crop production. However, 50% of the settlements have soil of moderate depth.

Overall suitability evaluation

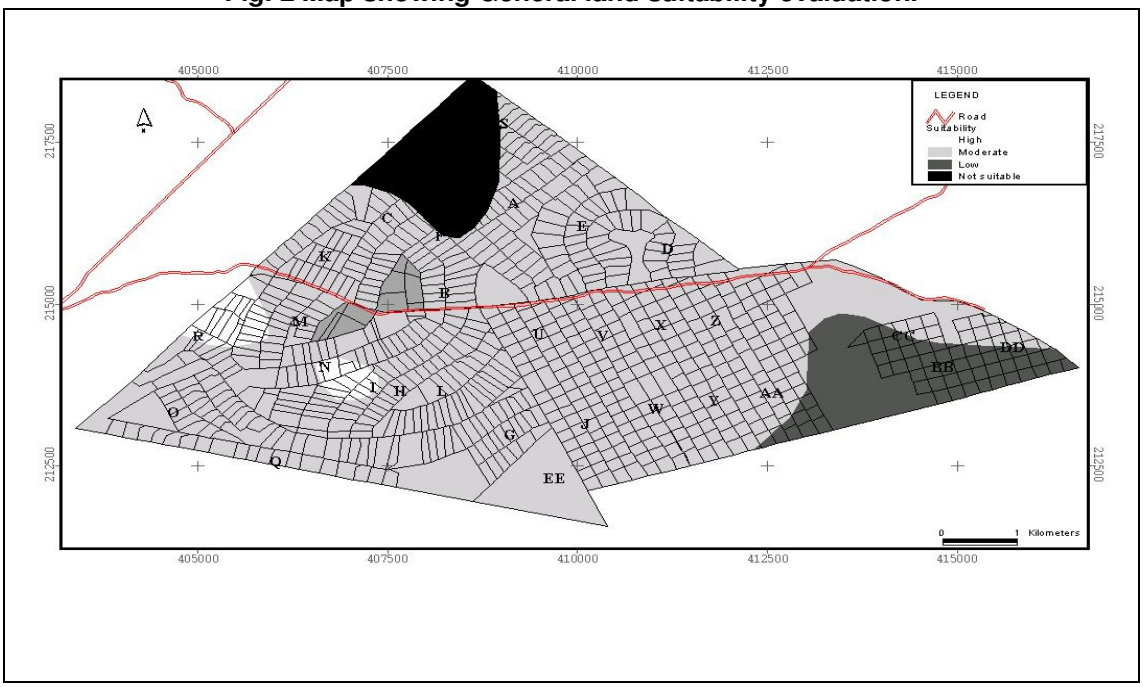
The overall suitability of land for arable farming based on the parameter of organic matter, soil moisture level and soil depth is as presented in Table 6.

Table 6: Overall land suitability for crop cultivation in different refugee settlement clusters

Cluster	*S0M*	*Smc*	*Sde*	*Overall Suitability*
V	S_2	S_2	S1	S2
Y	S_2	S_2	S2	S2
J	S_2	S1	S2	S2
M	S2	S1	S1	S1
AA	S2	S2	S3	S2
R	S1	S2	S1	S1
E	S1	S2	S2	S2
I	S1	S1	S1	S1
DD	S3	S2	S3	S3
CC	S3	S2	S3	S3
U	S2	S2	S3	S2
N	S2	S1	S1	S1
B	S2	S2	S2	S2
BB	S3	S2	S3	S3
EE	S2	S1	S2	S2
K	S2	S2	S2	S2
O	S2	S2	S2	S2
F	S2	S2	S2	S2

In the whole refugee settlement, areas of high suitability cover 22.2%. Areas of high suitability include cluster M, R, I and N. Here, maize productivity is highest. The study further noted that a larger section of the settlement (61.1%) was of moderate suitability (S_2). Areas with the low suitability (marginal suitability) comprised 16.6% of the settlement areas and include the cluster of CC, BB and DD. Productivity of the soils in this clusters were considerably lower. However, productivity of such lands can be improved through use of fertilizers. Figure 2 presents spatial suitability of the land in the refugee settlement for the selected crops.

Fig. 2 Map showing General land suitability evaluation.



CONCLUSION

Refugee settlements need to be made economically viable units that are self-sustaining. If this is to be achieved, there is need for a thorough land evaluation to be carried out to assess the potential of the land resources and what population it can sustain. Areas of high sustainability should be devoted to the most economically profitable activity.

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