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Examining the Diversity of Indigenous Woody Trees in Kitutu Chache North Sub- County, Kenya

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Abstract: *The main purpose this study was to examine the diversity of indigenous woody trees in Kitutu Chache North Sub-County, Kenya. The study applied a cross-sectional survey research design with a target population of 130 household heads in farmlands, 13 local leaders, 20 tree nursery owners and 10 forest officers. A sample size was 30% of the target population which translated to 53 respondents clustered into 39 household heads in farmlands, 5 local leaders 6 tree nursery owners and 3 forest Officers was used in the study. Stratified and simple random sampling procedures was used in the study. Questionnaire was used to collect quantitative data. The study applied quantitative data analysis techniques. The Statistical Package for Social Sciences (SPSS) version 22 was used to process the data. The study revealed that indigenous woody trees are important in farmlands due to their wide range of uses. It further revealed that indigenous woody trees have a very low diversity attributed to intensive farming practices that discourage their conservation. The study recommended the following: household heads in farmlands should encompass indigenous woody tree species in their agro-forestry activities; tree nursery owners should multiply seedlings of indigenous woody tree species using locally available seeds; the County Forest Department should establish a seed bank for indigenous woody tree species and sell to household heads at affordable prices; and local leaders should liaise with the Forest Department to disseminate valuable information on the improvement of the diversity of indigenous woody tree species in farmlands.*

Keywords: *Indigenous woody trees, Diversity of indigenous trees, Woody trees*

1.0 INTRODUCTION

Indigenous woody trees are important in Kenya because they act as carbon sinks, air and soil cleaners and also help in mitigating climate change and global warming (Kiprop, 2011). Importance of indigenous woody trees in farmlands and the country`s economic development is crucial for the realization of vision 2030. Therefore conservation of indigenous woody trees in farmlands in Kitutu Chache North Sub-County stands out because of its role in promoting environmental and economic growth of the region. According to the Statistical (2014), Kenya`s indigenous closed canopy dropped from 1,155 to 1,137 between the years 2009 and 2013. The decline in the diversity of indigenous woody trees in farmlands in Kitutu Chache North Sub-County is of great concern among household heads, local leaders and other forest stakeholders. There are limited comprehensive and confirmation studies on the extent of impact of farming practices on the diversity of indigenous

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woody trees in farmlands. Despite the importance of indigenous woody trees in farmlands, there is evidence that the diversity of indigenous woody trees is low in Kisii County. Bosire (2013) observed that there is very little native biodiversity remaining in Kisii County. This little native biodiversity may be attributed to intensive farming practices. Despite the many studies that have been conducted in the area, still the problem of low diversity of indigenous woody trees is persistent and has not been tackled conclusively. Consequently, the study intended to examine the diversity of indigenous woody tree species in Kitutu Chache North Sub-County, Kisii County of Kenya.

2.0 METHODOLOGY

The study adopted a cross-sectional survey research design. This design was selected due to it's suitability to cover the large target population, cost effectiveness and accuracy in terms of data collection. The target population of the study was 130 farmers in the five (5) selected sub-locations of: Igemo, Nyakeiri, Matembe, Sensi and Gesangero. The sample size of the study was 30% of the target population that translated to 53 respondents. These sample size included 39 household heads in farmlands, 5 local leaders, 6 tree nursery owners and 3 forest Officers. The researcher used stratified and simple random sampling procedures to select the study sample. Data collection instrument was a structured questionnaire. Data analysis was done based on the collected data from the questionnaire. By the help of statistical package of social science (SPSS) version 20, data from the questionnaire were input into the statistical package, coded and the outcome was used to summarize the research findings using tables and figures. Descriptive data were presented using simple frequencies and percentages. The study considered people's rights and ethical issues in research throughout the whole research process. For instance, the researcher strictly observed the principle of confidentiality, anonymity, and acknowledgement of other people's input throughout the whole study.

3.0 RESULTS

The study results were presented as follows: Demographic characteristics of the respondents; Diversity of Indigenous Woody Trees in Igemo Sub-location; Diversity of Indigenous Woody Trees in Nyakeiri Sub-location; Diversity of Indigenous Woody Trees in Metembe Sub-location; Diversity of Indigenous Woody Trees in Sensi Sub-location and Diversity of Indigenous Woody Trees in Gesangero Sub-location.

3.1 Demographic characteristics of the respondents

On distribution of the respondents by sex, 74% of the study respondents were male and 26% of them were female. With regards to the age of the respondents, majority (72%) of them were 50 years old and above. This was significant because this age represented most of the house hold heads in sampled farms, tree nursery owners, local leaders and forest Officers who were directly linked to the knowledge and control of indigenous woody tree species in the Sub-County hence very resourceful. More than a third (35%) of the study respondents had at least basic primary education. Only 11% of them had secondary education while another 54% of them had no formal education.

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3.2 Diversity of Indigenous Woody Trees in Igemo Sub-location

Household heads were requested to take the researcher round the farmlands to count the indigenous woody trees that existed. Table 1 below carries the results.

Table 1
Diversity of indigenous woody trees in Igemo Sub-location

Species	Frequency	Percent
Carissa edulis	1	0.5
Croton macrostachyus	18	8.5
Markhamia lutea	84	39
Sesbama sesban	110	52
Total	213	100

From Table 1, slightly more than half (52%) of the indigenous woody trees were *Sesbama sesban, Markhamia lutea* recorded 39%, *Croton macrostachyus* recorded 8.5% and *Carissa edulis* recorded 0.5%.

3.3 Diversity of Indigenous Woody Trees in Nyakeiri Sub-location

Household heads were also asked to take the researcher round the farmlands to count the indigenous woody trees that existed in farmland. Table 2 shows the frequencies of every species.

Table 2
Diversity of indigenous woody trees in Nyakeiri Sub-location

Species	Frequency	Percent
Erythrina abbysinica	2	0.6
Indigofera arrecta	1	0.4
Sepium ellipticum	3	1
Acrocarpus fraxinifohus	12	4
Markhamia lutea	73	26
Croton macrostachyus	76	27
Sesbama sesban	117	41
Total	284	100

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As shown in Table 2, *Sesbama sesban* recorded 41%, *Croton macrostschyus* recorded 27%, *Markhamia lutea* recorded 26%, *Acrocarpus fraxifohus* recorded 4%, *Sepium elliptum* rercorded 1%, *Indigofera arrecta* recorded 0.4% and *Erythrina abbysinica recorded 0.6%.*

3.4 Diversity of Indigenous Woody Trees in Metembe Sub-location

Household heads were requested to take the researcher round the farmlands to count the indigenous woody trees that existed. Table 3 shows the number of trees recorded.

Table 3

Diversity of indigenous woody trees in Metembe Sub-location

Species	Frequency	Percent
Erythrina abbysinica	1	0.8
Vernonia amygdalina	3	2.2
Ficus natalensis	2	1.5
Vangueria madagascariensis	5	3.6
Croton macrostachyus	31	22.5
Markhamia lutea	48	34.7
Sesbama sesban	48	34.7
Total	138	100

From Table 3, *Sesbama sesban* recorded of 34.7%, *Markhamia lutea* rercorded 34.7%, *Croton macrostachyus* recorded 22.5%, *Vangueria madagascariensis* recoded 3.6%, *Ficus natalensis* rercorded 1.5%, *Vernonia amygdalina* recorded 2.2% and *Erythrina abbysinica* recorded 0.8%.

3.5 Diversity of Indigenous Woody Trees in Sensi Sub-location

Household heads were further requested to help the researcher move around the farmlands to count the indigenous woody trees that existed in the farmlands as shown in Table 4.

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Table 4
Diversity of indigenous woody trees in Sensi Sub-location

Species	Frequency	Percent
Croton macrostachyus	19	6
Markhamia lutea	69	22
Sesbama sesban	228	72
Total	316	100

From Table 4, *Sesbama sesban* recorded 72%, *Markhamia lutea* recorded 22% and *Croton macrostachyus* recorded 6%.

4.0 DISCUSSION

4.1 Diversity of Indigenous Woody Trees in Igemo Sub-location

Only four different species of indigenous woody trees were identified in the sampled farmlands within Igemo Sub–location as shown in table 1 above. *Sesbam sesban* recorded the highest frequency (110). This species was identified mainly in small scale tea farms and small scale maize farms. *Markhamia lutea* followed with a frequency of 84 trees. This species was identified mainly in small scale maize farms, in open field for grazing livestock and along the hedges of farms. *Croton macrostachyus* came at position three with a frequency of 18 trees. This species was mainly identified in open fields for grazing livestock and along the hedges of farms. Further, *Carissa edulis* was forth with a frequency of one tree. It was identified in an open field for grazing livestock and the household head said that it germinated on its own. This was in line with Bosire (2013) who asserted that in Kisii County there was very little indigenous biodiversity remaining.

4.2 Diversity of Indigenous Woody Trees in Nyakeiri Sub-location

In nyakeiri Sub-location a total of seven different species of indigenous woody trees were identified in farmlands. These species included *Sesbama sesban, Croton macrostachyus, Markhamia lutea, Acrocarpus fraxinifolins, Sepium elliptum, Erythrina abbysinica,* and *Indigofera arrecta* as presented in table 2. *Sesbama sesban* recorded the highest frequency of 117 trees. It was mainly identified in small scale tea farms as well as small scale maize farms. *Croton macrostachyus* was position two with a frequency of 76 trees. This species was identified mostly found in open fields for grazing livestock and along the hedges of farms. *Markhamia lutea* came at position three with a frequency of 73 trees. It was identified mostly in small scale maize farms along hedges of farms and in open fields for grazing livestock. *Acrocarpus fraxinifolins* came at position four with a frequency of 12 trees. This species was identified near homesteads where vegetables were grown. *Sepium*

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ellipticum came at position five with a frequency of three trees. This species was identified along the hedges of farms. *Erythriina abbysinica* came at position six with a frequency of two trees. It was identified in small scale maize farms. *Indigifera arrecta* was at position seven with a frequency of one tree. It was identified in a vegetable small farm. This was again in line with Bosire (2013) who asserted that there was little indigenous biodiversity remaining in Kisii County.

4.3 Diversity of Indigenous Woody Trees in Metembe Sub-location

A total of seven different species of indigenous woody trees were identified in farmlands. These species included *Sesbama sesban, Markhamia lutea, Croton macrostachyus, Vangueria madagascariensis, Vernonia amygdalina, Ficus natalensis and Erythrina abbysinica. Sesbama sesban* and *Markhamia lutea* recorded the highest frequency of 48 trees each. *Sesbama sesban* was identified mainly in small scale tea farms while *Markhamia lutea* was identified in open field for grazing livestock and along hedges of farms. *Croton macrostachyus* came at position three with a frequency of 31 trees. This tree species was identified in open field for grazing livestock as well as along hedges of farms. *Vangueria madagascariensis* came at position four with a frequency of five trees which were identified in fields for grazing livestock. *Vernonia amygdalina* came at position five with a frequency of five trees. This species was identified in open fields for grazing livestock. *Ficus natalensis* came at position six with frequencies of two trees in a section of trees in a farm. *Erythrina abbysinica* came at position seven with only one tree along the hedges of a farm. These results were in line with Seburanga (2013) who asserted that the apparent decline of indigenous crop diversity in Rwanda based on the cultural disturbance was attributed to European colonisation which introduced eucalyptus tree on the land.

4.4 Diversity of Indigenous Woody Trees in Sensi Sub-location

A total of three different species of indigenous woody tree were identified in farmlands within Sensi Sub-location .These species were: *Sesbama sesban, Markhamia lutea* and *Crotono macrstachyus* as represented in the table 4. *Sesbama sesban* recorded the highest frequency with 228 trees. These trees were mainly identified in small scale maize farms. *Markhamia lutea* came at position two with a frequency of 69 trees. These were identified in an open field for grazing livestock, along the hedges of a farm and in small scale maize farm. *Croton macrostachyus* came at position three with a frequency of 19 trees identified in an open field for grazing livestock as well as long hedges of a farm. This was in contrast with Omoro (2010) who asserted that indigenous forest was more diverse in species as would be expected in the tropics according to the biodiversity assessmemt for tree species conducted in the three fragments of Taita Hills.

4.5 Diversity of Indigenous Woody Trees in Gesangero Sub-location

In Gesangero Sub- location a total of five species of indigenous woody trees were identified in farmlands. These species included: *Sesbanma sesban, markhamia lutea, Sepium elliptum* and *Ficus natalensis* as presented in the table 5. *Sesbama sesban* recorded the highest frequency with 80 trees. These trees were mainly identified in small scale tea farms.

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Croton macrostachyus came at position two with a frequency of 44 trees identified in open fields for grazing livestock as well as along hedges of farm. *Markhamia lutea* came at position three with a frequency of 35 trees. These trees were identified mostly in open fields for grazing livestock and along hedges of farms. *Sepium ellipticum* came at position four with a frequency of one tree identified along the hedges of a farmland. *Ficus natalensis* was position four with a frequency of one tree identified near a river together with other trees mainly blue gum .This result was in line with Schulze (2015) who asserted that central Europe had the minimum number of native three species due to environmental changes during neogene.

5.0 CONCLUSIONS

There was a very low diversity of indigenous woody trees in farmlands. The majority of the farmlands were dominated by three indigenous woody tree species namely *Sesbam sesban, Markhamia lutea,* and *Croton macrostachyus* which were moderate in terms of even distribution across farmlands in the five sampled Sub-locations within the study area. It was also found out that generally, the quantity of indigenous woody tree species in farmlands of the five sampled Sub-locations was very low. Moreover, ten of the twelve identified indigenous woody tree species were very scanty in quantity which implied that they were on the verge of distinction if urgent measures would not be put in place to secure their survival in farmlands.

The study drew a number of recommendations. First, household heads should protect the rare species of indigenous woody tree species such as *Erythrina abbysinica* by allowing the trees to grow, mature and multiply in farmlands. This will prevent such rare species from becoming extinct. Moreover, tree nursery owners should use the a few seeds of the rare indigenous woody trees that might be available to multiply the population so that household heads in farmlands can easily access them for planting. This in turn will increase the diversity of the tree species in farmlands. In addition, the County Forest Department should establish a seed bank for indigenous woody trees and disseminate them to household heads at an affordable price for planting in farmlands through local leaders. This will encourage agro-forestry of the trees leading to higher diversity in farmlands. Further, local leaders should liaise with the County Forest Department to ensure that household heads in farmlands constantly get valuable information regarding the improvement of the diversity of indigenous woody trees in farmlands. The County Forest Department should also intensify research on fast maturing indigenous woody tree species in order to motivate household heads to plant more of these trees in farmlands. This will improve the diversity of the tree species quickly.

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