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Academic Research Journal of Agricultural Science and Research

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Table of Content: May; 3(5)

academicresearchJournals

Vol. 3(5), pp. 86-91, May 2015
DOI: 10.14662/ARJASR2015.009

ISSN: 2360-7874
http://www.academicresearchjournals.org/ARJASR/Index.htm

Academic Research Journal of Agricultural Science and Research

Full Length Research

Effects of Soil Conservation on the Yield of Crops among Farmers in Upper East Region of Ghana

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Accepted 9 March 2015

This study was carried out in Talensi Nabdam District of Upper East Region of Ghana to assess the effect of soil conservation on the yield of millet and groundnut among farmers. Random sampling was used to select 50 farmers from seven communities namely Belungu, Kongo, Damolgo, Zalerigu, Dagliga, Nangodi, and Arigu. Questionnaires administered in the area provided primary data needed for analysis. Descriptive statistics was employed in describing the socio-economic characteristic of farmers and independent-samples t-test was used to compare the output of millet and groundnut farmers that adopted stonebunds, earthbunds, vertiver grass and manure by using SPSS. Male farmers 300 constituted the majority of adopters of the conservation methods and non-adopters represented 20. The group means 190.83 for output of adopters of stonebunds and 95.28 for output of non-adopters of stonebunds were significantly different. Farmers who adopted stonebunds had higher yield of groundnut than those who did not adopt stonebunds. The group means 158.95 for output of adopters of earthbunds and 173.83 for output of non-adopters of earthbunds were significantly different. Adopters of stonebunds had higher output of millet than non-adopters.

Keywords: yield; soil; conservation; effect; Sudan

INTRODUCTION

Despite the predominantly gentle slope, about 70 percent of the country is subject to severe or moderate erosion of which the Upper East Region is the most erosion prone region and the is decline in soil fertility, low organic matter content and high level of environmental and land degradation is one of the challenges of Agriculture (IFAD, 2010).

Soil erosion is a major problem that threatens continued and sustained agricultural production in Ghana (Folly, 1997). Large tracts of land have been destroyed

by water erosion leading to soil and nutrient losses as well as flooding and siltation of river bodies (Quansah, 2001). Evidence provided by the Ghana's Soil Research Institute indicated that 29.5 percent of the country's soil is subjected to slight to moderate sheet erosion, 43.3 percent to severe sheet and gully erosion and 23 percent to very severe sheet and gully erosion (Quansah et al, 1989). The northern parts of Ghana are relatively much more affected by erosion than the Southern parts (Asiamah and Antwi, 1988). However, soil erosion continues to accelerate as a result of the intensification of agricultural production often considered to be associated with the increased population pressure (Adu and Owusu, 1996). The soil removed is not the only problem.

The eroded sediment often contains higher concentrations of organic matter and plant nutrients in available forms than the soil from which it is eroded (Quansah and Baffoe-Bonnie, 1981). Smaller erosion losses which may seem unimportant with respect to volume of soil removed may therefore be very important as far as the nutritional depletion and the general decline in the productive capacity of the surface soil is concerned (Asiamah and Antwi, 1988). The Upper East Region is the poorest Region in Ghana and one of the most seriously affected Regions by soil erosion. Large tracts of land have been destroyed by rill, sheet and gully erosion and through figures of absolute quantities of soil eroded are scanty; the few available studies reveal alarming losses of soil (Quansah, 1990).

In savannah environment of the Upper East Region, (Adu, 1972) reported a loss of 90cm of soil by sheet and rill erosion but in some severely eroded savannah lands, as much as 120cm of soil has been lost above the unweathered parent rock. While it takes only one year to lose 1cm of top soil, it is estimated to take about 12 years to replace it under ideal soil and climatic conditions (Hudson, 1981) and 120-400 years under normal conditions (Asiamah and Antwi, 1988; Friend, 1992). Generally, the agricultural soils are light, sandy and non-cohesive, heavier soils being found in valley bottoms. The soils are generally highly susceptible to erosion. Poor cultivation practices enhance erosion of these light soils and cause sedimentation problems when practiced in reservoir (Asiamah, 1988). Land degradation poses many challenges for farmers, planners, researchers and decision makers. Discussions of land degradation tend to focus on causes, consequences and nutrient decrease. Much issue has been devoted to the issue of water-related soil erosion in particular (Ahmad, 2009). Water erosion has long been recognized as a critical problem spawning serious environmental and economic consequences. Researchers and farmers have developed technologies and farming practices to reduce the impacts of soil erosion both on and off the farm.

Government of Ghana has exerted enormous effort in attempting to curb soil losses through extension education. Yet soil conservation efforts have not met with broad success and erosion continues to be a serious environmental problem (Surry, 1997).

Since the 1950s, most agricultural extension efforts in Ghana have been production based. Recently the focused has shifted slightly to conservation. Whiles the have been a research tradition in the U.S. devoted to understanding factors influencing the soil conservation behavior of farmers, this has not been the case in Ghana (Cramb, 1999). This study was carried out in Talensi Nabdam District in the Sudan Savannah zone of Ghana to assess the effect of soil conservation on the yield of crops.

MATERIALS AND METHODS

Data Type, Source and Sampling

Random sampling was used to select 50 farmers from seven communities namely Belungu, Kongo, Damolgo, Zalerigu, Dagliga, Nangodi, and Arigu. The research design and data collection involved both primary and secondary sources. Primary data were collected from the sampled household by administering questionnaire.

Statistical Analysis

Descriptive statistics was employed in describing the socio-economic characteristic of farmers and independent-samples t-test was used to compare the output of millet and groundnut farmers that adopted stonebunds, earthbunds, vertiver grass and manure by using SPSS.

RESULTS AND DISCUSSION

Table 1 below shows the socio-economic characteristics of adopters and non-adopters of conservation methods. Male farmers constituted the majority of adopters of the conservation methods 300 and non-adopters represented 20, age range 40-49 recorded 130 of majority of adopters whiles non-adopters of the conservation methods recorded age range of majority 50-59. This implies that adopters of the conservation methods were in the active age than non-adopters. From the study, about 200 farmers of the adopters of the conservation methods did not have access to education whiles the non-adopters are more into primary/middle education representing 10.

Comparison of output of millet farmers of adopters and non-adopters of the conservation technologies

Table 2 below shows the variables used in the

Table 1: socio-economic characteristic of household of adopters and non-adopters of conservation methods

Variable	Frequency of Adopters	% of adopters	Frequency of non-adopters	% of non-adopters
Sex				
Male	300	300	20	20
Female	20	20	10	10
Age distribution				
20-29	30	30	12	12
30-39	79	79	14	14
40-49	130	130	10	10
50-59	50	50	18	18
60-69	12	12	8	8
70-79	10	10	4	4
80-89	4	4	4	4
Formal education				
No schooling	200	52	2	2
Primary/middle	10	5	10	10
Junior high	20	9	7	7
Tertiary	5	2	1	1
Marital status				
Single	3	4	2	2
Married	250	25	50	50
Widowed	9	4	1	1
Divorce	1	1	0	0

Source: field survey, 2010

independent-samples t-test. The test (dependent) variables were outputs of millet farmers that were adopters and non-adopters of the conservation methods which were in kilogram. The group (independent) variables in this study were defined as follows: stonebunds-This was coded as a dichotomous variable with 1 if a farmer adopts stonebunds and 0 if otherwise, 1 if a farmers adopts earthbunds and 0 if otherwise, 1 if a farmer adopts vertiver grass and 0 if otherwise, 1 if a farmer adopts manure and 0 if otherwise.

Results of independent-samples T-test

From Table 2 below, the results of the independent-samples t-test shows that, the group means 321.25 for output of adopters of stonebunds and 268.10 for output of non-adopters of stonebunds were significantly different because the value in the sig (2 tailed) row 0.01 and 0.03 were less than 0.05. This implies that, those farmers who adopt stonebunds had high output of millet than those who did not adopt stonebunds.

The group means 278.23 for output of adopters of earthbunds and 316.61 for output of non-adopters of earthbunds were significantly different because the value in the sig (2 tailed) row 0.02 and 0.00 were less than 0.05. This implies that, those farmers who adopt earthbunds had low output of millet than those who did not adopt earthbunds.

The group means 273.40 for output of adopters of vertiver grass and 317.68 for output of non-adopters of vertiver grass were significantly different because the value in the sig (2 tailed) row 0.00 and 0.003 were less than 0.05. This implies that, those farmers who adopt vertiver grass had low output of millet than those who did not adopt vertiver grass.

The group means 341.62 for output of adopters of manure and 307.97 for output of non-adopters of manure were significantly different because the value in the sig (2 tailed) row 0.00 and 0.01 were less than 0.05. This implies that, those farmers who adopt manure had high output of millet than those who did not adopt manure.

Comparison of output of groundnut farmers of adopters and non-adopters of the conservation technologies

Table 3 below shows the variables used in the independent-samples t-test. The test (dependent) variables were outputs of groundnut farmers that were adopters and non-adopters of the conservation methods which were in kilogram. The group (independent) variables in this study were defined as follows:

Table 2: Results estimate of independent-samples t-test of millet farmers that are adopters and non-adopters of the conservation methods

Dependent variable	Mean	Standard deviation	Sig (2-tailed)
Output of adopters of stonebunds	321.25	299.236	0.01
Output of non-adopters of stonebunds	268.10	151.816	0.03
Output of adopters of earthbunds	278.23	244.666	0.01
Output of non-adopters of earthbunds	316.61	282.023	0.02
Output of adopters of vertiver grass	273.40	225.743	0.00
Output of non-adopters vertiver grass	317.68	285.006	0.003
Output of adopters of manure	341.62	228.899	0.00
Output of non-adopters manure	307.97	280.032	0.01

Source: SPSS independent-samples t-test analysis

stonebunds-This was coded as a dichotomous variable with 1 if a farmer adopts stonebunds and 0 if otherwise, 1 if a farmers adopts earthbunds and 0 if otherwise, 1 if a farmer adopts vertiver grass and 0 if otherwise, 1 if a farmer adopts manure and 0 if otherwise.

Results of independent-samples T-test

From Table 3 below, the results of the independent-samples t-test shows that, the group means 190.83 for output of adopters of stonebunds and 95.28 for output of non-adopters of stonebunds were significantly different because the value in the sig (2 tailed) row 0.01 and 0.00 were less than 0.05. This implies that, those farmers who adopt stonebunds had high yield of groundnut than those who did not adopt stonebunds.

The group means 158.95 for output of adopters of earthbunds and 173.83 for output of non-adopters of earthbunds were significantly different because the value in the sig (2 tailed) row 0.002 and 0.003 were less than 0.05. This implies that, those farmers who adopt earthbunds had lower yield of groundnut than those who did not adopt earthbunds.

The group means 98.14 for output of adopters of earthbunds and 185.71 for output of non-adopters of vertiver grass were significantly different because the value in the sig (2 tailed) row 0.005 and 0.001 were less than 0.05. This implies that, those farmers who adopt vertiver grass had low yield of groundnut than those who did not adopt vertiver grass.

The group means 225.50 for output of adopters of earthbunds and 167.11 for output of non-adopters of manure were significantly different because the value in the sig (2 tailed) row 0.004 and 0.005 were less than 0.05. This implies that, those farmers who adopt vertiver grass had high yield of groundnut than those who did not adopt manure.

CONLUSION

Male farmers 300 constituted the majority of adopters of the conservation methods and non-adopters represented

Table 3: Results estimate of independent-samples t-test of groundnut farmers that are adopters and non-adopters of the conservation methods

Dependent variable	Mean	Standard deviation	Sig (2-tailed)
Output of adopters of stonebunds	190.83	216.571	0.01
Output of non-adopters of stonebunds	95.28	189.131	0.00
Output of adopters of earthbunds	158.95	211.859	0.002
Output of non-adopters of earthbunds	173.83	215.219	0.003
Output of adopters of vertiver grass	98.14	156.829	0.005
Output of non-adopters vertiver grass	185.71	221.424	0.001
Output of adopters of manure	225.50	190.286	0.004
Output of non-adopters manure	167.11	216.018	0.005

Source: SPSS independent-samples t-test analysis

20. The group means 190.83 for output of adopters of stonebunds and 95.28 for output of non-adopters of stonebunds were significantly different. Farmers who adopted stonebunds had higher yield of groundnut than those who did not adopt stonebunds.The group means 158.95 for output of adopters of earthbunds and 173.83 for output of non-adopters of earthbunds were significantly different.Adopters of stonebunds had higher output of millet than non-adopters.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the Director and Staff of the Ministry of Food and Agriculture (MOFA), Bolgatanga for providing us with the necessary information for the study. We thank Mr. Suleiman Mathew, the Technical Officer of MOFA at Bolgatanga for helping us during our data collection. We are grateful to all the Lecturers in the Department of Agricultural Economics, Agribusiness and Extension for their constructive advice, comments and suggestions. Our deepest appreciation goes to Mr. Ayuburi Samuel for his tremendous assistance to us during our field work. To the Staff of the Department of Soil and Water Management at Ministry of Food and Agriculture, God richly bless you for the kind assistance given to us during our data collection.

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Vol. 3(5), pp. 92-95, May 2015
DOI: 10.14662/ARJASR2015.010

ISSN: 2360-7874
http://www.academicresearchjournals.org/ARJASR/Index.htm

Academic Research Journal of Agricultural Science and Research

Full Length Research

Determinants of Poverty among Tomato Farmers in Upper East Region of Ghana

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Accepted 16 March 2015

This study was conducted in Talensi and Nabdam districts of the Upper East Region of Ghana. Much of the tomato is being cultivated in these districts and yet the poorest with low income. The study was therefore conducted to investigate the determinants of poverty among tomato farmers. Pwalugu, Pusu-Namogo, Winkogo, Yindure and Arigu were the communities which were purposively selected in Talensi and Nabdam districts. A total of 100 farmers were selected and the simple random technique was used to select 20 rural farmers from each community. The linear regression was used in SPSS to estimate the poverty determinants of the farmers. Data collected include, marital status, age, sex, extension contact, access to credit, farming experience, education, farm income, farm size and kind of labour using questionnaire. It was observed that, extension contact, farming experience, educational level, access to credit and gender are important determinants in reducing poverty as against age and marital statue.

Keywords: Poverty, Determinants, Farmers, Tomato, Ghana, Upper East Region

INTRODUCTION

Global hunger afflicts nearly one billion of our Earth's population (FAO, 2009). In addressing this vast problem, hunger, famine, and food security scholars target rural communities reliant on subsistence farming or agriculture-related livelihoods (Kracht & Schultz, 1999).

The link between poverty and land degradation is said to be a symbiotic one in a form of a vicious cycle. It is considered as a downward spiral (Berry et al., 2003) in which causality runs both ways (Perrings, 1989). Hence, poverty reduction should be tackled alongside the control of land degradation (Gisladottir et al., 2005) and UNCCD, 2012.

In Ghana as well as other developing countries, land degradation is a major problem due to the agrarian nature of their economy. Most Ghanaians (70%) depend on the land for their livelihoods (Environmental protection agency, 2002) and Stocking, 2005. The fundamental importance of land extends to dependence on food, fibre, fuel and general ecosystem provisions of fresh air (oxygen) water and climate regulation. The growing reliance on the land for timber, agricultural produce and minerals has extracted land productivity over the past several years (Environmental protection agency, 2002).

The three northern regions of Ghana portray the highest incidence of poverty and occurrence of land degradation (Diao et al., 2011) and Boahen et al., 2007).Northern Ghana experiences ecological and economic marginality, especially in the current Upper-East Region, which has been plagued with looming desertification and a high incidence of destitution. This

area has a history of chronic malnutrition and enduring poverty, even if it has not suffered massive famine mortality (Reyna, 1990)

This study therefore seeks to investigate the determinants of poverty among tomato farmers in Talensi-Nabdam district of Upper East Region of Ghana.

METHODOLOGY

Description of the Study Area

Talensi Nabdam District is one of the young districts created in 2004. It was carved out from the then Bolgatanga District Assembly. The Assembly (TNDA) is under the Ministry of local Government, Rural Development and Environment. The Assembly's sphere of influence covers the delineation of the Talensi Nabdam constituencies LI 1739, 2004. It has its capital at Tongo. It is bordered to the North by the Bolgatanga municipal, to the south by the West and East Mamprusi Districts (both in the northern region), Kassena-Nankana district to the west and Bawku west district to the East.

The district has a total population size of 100,879 made up of 50,865 females and 50,014 males, thus a gender ratio of 50.4% and 49.6% respectively; and has a population density of 10.6; based on the population and Housing census of 2000-2006. The population is mainly rural with about 90% not educated (MOFA, 2008). The female population form a majority of the illiterate population in the district (MOFA, 2008). There are mainly two ethnic groups in the district; Talensi and Nabdam. However there are traces of a few minority tribes settling in the district; notably gurunes, Mamprusi and Asantes who migrated years ago for various reasons from adjoining communities.

The climate is described as tropical and has two distinct seasons, wet and rainy season which is erratic and runs from May to October and a long dry season that stretches from October to April with hardly any rains. The annual rainfall is 950mm.The area experiences a maximum temperature of 45^{o}C in March and April and a minimum of 12^{o}C in December.

The vegetation is guinea savannah woodland consisting of short widely spread deciduous trees and a ground flora of grass which get burnt by fire or the scorch sun during the long dry season. The most common economic trees are the sheanuts, dawadawa, baobab and acacia.

The district soil is upland soil mainly developed from granite rocks. It is shallow and low in soil fertility, weak with low organic matter content and predominantly coursed textured. Erosion is a problem. Valley areas have soils ranging from sandy candy to salty clays. They have higher natural fertility but are more difficult to till and are prone to seasonal water lodging and floods and drainage is mainly by the white and red Volta and Sissili rivers (Regional Coordinating Unit, 2003).

The district has 180 towns and villages with a settlement pattern which is predominantly rural. The spatial organization settlement is dispersed, which render service location and provision very difficult. It has settlement falling within level three, four and five. The settlement pattern allows for compound farming and the rearing of animal. The area is not scheme, to guide development and so the proliferation of physical developments is mostly haphazard as development is fast outstripping planning interventions. The district has total number 8,839 houses, 16,375 households and also has an average household size of 6 persons and room occupancy of 4-5 persons. It has two main dialectic areas, the Talensi and Nabdam; who speak Taleni and Nabit. Figure 1

Data collection

Data collected include, marital status, age, sex, extension contact, access to credit, farming experience, education, farm income, farm size and kind of labour using questionnaire. Secondary data was also collected from Ministry of Food and Agriculture.

Sampling Technique

Pwalugu, Pusu- Namogo, Winkogo, Yindure and Arigu were the communities which were purposively selected in Talensi and Nabdam districts. A total of 100 farmers were selected and the simple random technique was used to select 20 rural farmers from each community.

Analytical technique

The linear regression was used in SPSS to estimate the poverty determinants of the farmers.

RESULTS AND DISCUSSIONS

Determinants of poverty Linear Regression Estimate

From the results of the regression estimate below, R-squared is 0.239 and adjusted R-squared is 0.163 which is significant at one percent level. That means that the regression has a good fit to the data and also explains significant non-zero variations in the determinants of factors of poverty.

Gender has a coefficient of 0.098 and is significant at one percent, which means a unit increase in either male or female would decrease the poverty level by 0.098. This means if more women engaged into farming, poverty would decrease.

The educational level of the farmers has a coefficient of

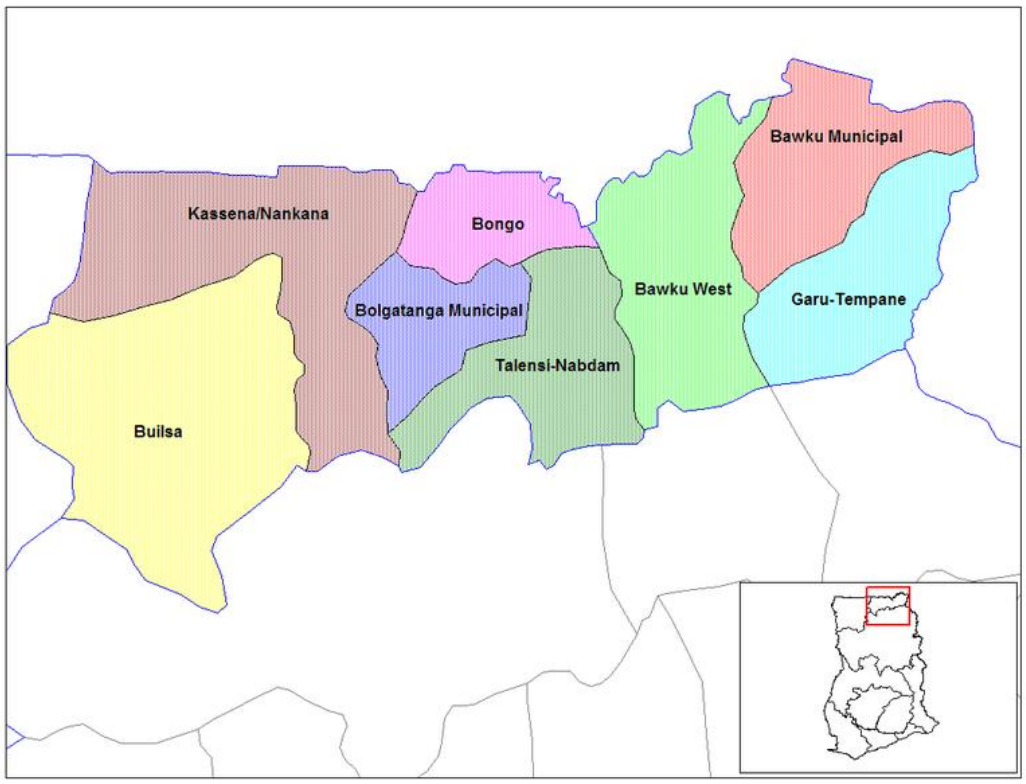

Figure 1; Map of Talensi-Nabdam District

0.139 and is significant at 1% which implies, a unit increase in the educational level of the farmers would decrease poverty by 0.139. About 70% of the farmers have no access to basic education.

Also, years of farming experience has a coefficient of 0.112 and is significant at 1% which means a unit increase in farming experience would increase poverty by 0.112. This is because as age of the farmer increases, experience also increases and the strength to do work well also decreases and this is testified by a study done by Farida & Fariya, 2014 on analysis of production and marketing of tomato in that district that tomato production is an age long profession of the people in that area.

Extension contact has a coefficient of 0.057 which is significant at 1% implying that a unit increase in extension contact would decrease the poverty level by 0.057.

Kind of labour has a coefficient of 0.240 and significant at 1% meaning a unit increase in labour would increase poverty by 0.240. Tomato is labour intensive and the amount of money spent on hired labour alone would reduce the income of the farmer and hence increase poverty among tomato farmers. Farm income has a coefficient of 0.106 and is also significant at 1% which means a unit increase in farm income would increase poverty by 0.106. This is because most of the farmers use their own money to farm and at the end of the day the return expected to pay for the cost of production and the purchasing power of other things and school fees is not sufficient and that would increase to poverty.

Access to credit has a coefficient of 0.188 and is significant at 1% implying that a unit increase in credit availability would decrease poverty by 0.188. Access to credit is one of the major problems the farmers were facing and this is confirmed by a study done by Farida & Fariya, 2014 that access to credit is one of the major problems the farmers were facing in that district. If credit is available to farmers, their farm sizes would increase which would also increase production and at the same time decrease poverty. Table 1

CONCLUSION

It was observed that, extension contact and farming experience, educational level, access to credit and gender are important determinants in reducing poverty as against the others.

Table1. Maximum Likelihood Estimates of Linear Regression for Tomato Farmers

Variable	Coefficient	t-value
Age of respondence	0.000	-0.008
gender	-0.098	-0.985***
Marital statue	0.051	0.506
Educational level	-0.139	-1.447***
Years of farming experience	0.112	1.045***
Extension contact	-0.057	-0.598***
Kind of labor	0.240	2.128***
Farm income	0.106	0.825***
Access to credit	-0.188	-1.893***
R-squared 0.239	**Adjusted R-squared 0.163**	

*** denotes significant at 1%

ACKNOWLEDGEMENT

The authors wish to thank the Ministry of Food and Agriculture, and all farmers for their time in responding to our questions and all others who have contributed in one way or the other in this work.

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Vol. 3(5), pp. 96-101, May 2015
DOI: 10.14662/ARJASR2015.011

ISSN: 2360-7874
http://www.academicresearchjournals.org/ARJASR/Index.htm

Academic Research Journal of Agricultural Science and Research

Full Length Research

Farmers' Perception on Soil Erosion Problems and Conservation Methods among Rural Farmers in Talensi-Nabdam Districts of Upper East Region of Ghana

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Accepted 15 March 2015

This study was carried out in Upper East Region of Ghana, Talensi-Nabdam districts,to assess how farmers perceive soil erosion problems and the causes that trigger soil erosion problems, identify the existing soil conservation practices adopted by farmers on their farms and examine the socio-economic and constraints influencing farmer's perceptions to implement different soil conservation methods. Five communities were purposively selected from that district namely Belungu, Kongo, Damolgo, Zalerigu and Nangodi. A total of 100 farmers were selected and the simple random technique was used to select 20 farmers from each community. These five communities were selected because of the severity of erosion in those areas. Data was analysed using frequency tables and percentages of descriptive statistics in SPSS. Male's form 79% of the respondents and 21% were females. The perceptions of farmers on the causes of erosion in the study area were: high intensity of rainfall, inadequate vegetative cover, deforestation and lack of proper conservation methods. The indicators of soil erosion problems in the study were presence of gullies (45%) making it impossible for profitable cultivation , 20% said removal of the top soil by water or wind, 20% reported that it makes the land infertile, 5% as exposure of the root of trees and finally change of soil color as 5%.The conservation methods adopted by the farmers include; stonebunds, earthbunds, vertiver grass, manure, local grass, tree planting, drainage trench, wood logs and ploughing across slope.

Keywords: Farmers, Perception, Soil erosion, Conservation methods, Ghana.

INTRODUCTION:

Soil erosion is a major threat to continued and sustained agricultural production in Ghana particularly in the Sudan Savanna zone (Folly, 1997). The effect of erosion may be on-site and/or off-site. The on-site damage, which affects the catchment where the erosion originates, includes soil structure degradation, increases erodibility, surface crusting and compaction (Adwubi et al., 2009). The most severely affected areas are the three Northern Savanna Regions, particularly the Upper East Region, where large tracts of land have been destroyed by water erosion leading to soil depth reduction, soil fertility decline and siltation of rivers and reservoirs (Adwubi *et al.,* 2009).

Sustainable agricultural production also depends on productive soils, but the land resources of Ghana for that

matter Upper East Region, particularly the soils, are being degraded as a result of both natural and anthropogenic factors (Adama, 2003).

The loss of soil reduces depth, water and nutrient storage capacities of the soil. The reduction in moisture reduces the soil's potential to sustain plant growth, exposes the plant to frequent and severe water stress which ultimately results in reduced crop yields. Many of the soils have predominantly light-textured surface horizons and extensive areas of shallow concretionary and rocky soils with low water and nutrient holding capacities and limited capacity for agriculture (Quansah et al., 2000).

Evidence suggests that, adopting sustainable land management technologies can reduce soil erosion and enhance productivity. Since 1940's, a number of policy instruments have being used in an attempt to control or mitigate soil erosion in rural areas Stonehouse (1991).

This study was conducted in Talensi district (Northern part of Ghana). The district, as one part of Upper East Region, is affected by land degradation particularly soil erosion.

The objective of this study was to assess how farmers perceive soil erosion problems and the causes that trigger soil erosion problems, identify the existing soil conservation practices adopted by farmers on their farms and examine the socio-economic and constraints influencing farmers perceptions to implement different soil conservation methods.

MATERIALS AND METHODS

Data Type, Source and Sampling and analysis:

The study population comprised of all small holder farmers in the Talensi Nabdam District.Five communities were purposively selected from that district namely Belungu, Kongo, Damolgo, Zalerigu, Nangodi. A total of 100 farmers were selected and the simple random technique was used to select 20 farmers from each community. These five communities were selected because of the severity of erosion in those areas.

Data was analysed using frequency tables and percentages of descriptive statistics in SPSS.

RESULTS AND DISCUSSION:

Socio-economic characteristics of rural farmers

Male's form 79% of the respondents and 21% were females. This indicates that, majority of the rural farmers were males. A study done by Farida & Fariya, 2014 in the study area indicates that men had more access to financial capital than women in the community and also it is a risky venture and women appeared not to be ready to take so much risk for fear of incurring debts. Majority of the farmers (44%) were between the ages of 31-40 years. 40% were more than forty years, 16% were between the ages of 21-30 years. Majority of the farmers in the study area owned their land (70%) and some also rented land (30%) from others for their production activities. The land rent is determined by the quality of land in respect of its suitability for the crop the farmer would be growing. Major land quality aspects considered are soil fertility and irrigation water availability. Hired labour was the major source of labour representing (41%) followed by family labour of (30%) and then those who were using both family and hired labor of 29% for their farming operations. Almost all the farmers used hired labour because their family members were engaged in other household or other business activities. Eighty nine percent (89%) of the respondents used their personal resources as seen in the Table 1 but 7% received some finance from financial institutions, 3% from relatives and friends and 1% from traditional money lenders. The reasons given by the farmers for using their own money for financing were due to non-availability and /or the high cost of credit. All are shown in the Table 1.

The Perception of Farmers' About the Causes and Indicators of Soil Erosion Problems in the District.

The perceptions of farmers on the causes of erosion in the study area are: high intensity of rainfall, inadequate vegetation cover, deforestation and lack of proper conservation methods.

Farmer's perception of soil erosion problems refers to the perception to relationship and processes of soil erosion and fertility of the soil (Belay, 2014). The indicators of soil erosion problems in the study area are shown in the diagram below: Majority of the farmers reported presence of gullies (45%) making it impossible for profitable cultivation. Similar study done elsewhere shows presence of gullies as the major indicator of soil erosion in Ethiopia (Belay, 2014), 20% said removal of the top soil by water or wind, 20% reported that it makes the land infertile, 5% as exposure of the root of trees and finally change of soil color as 5% as shown in Figure 1.

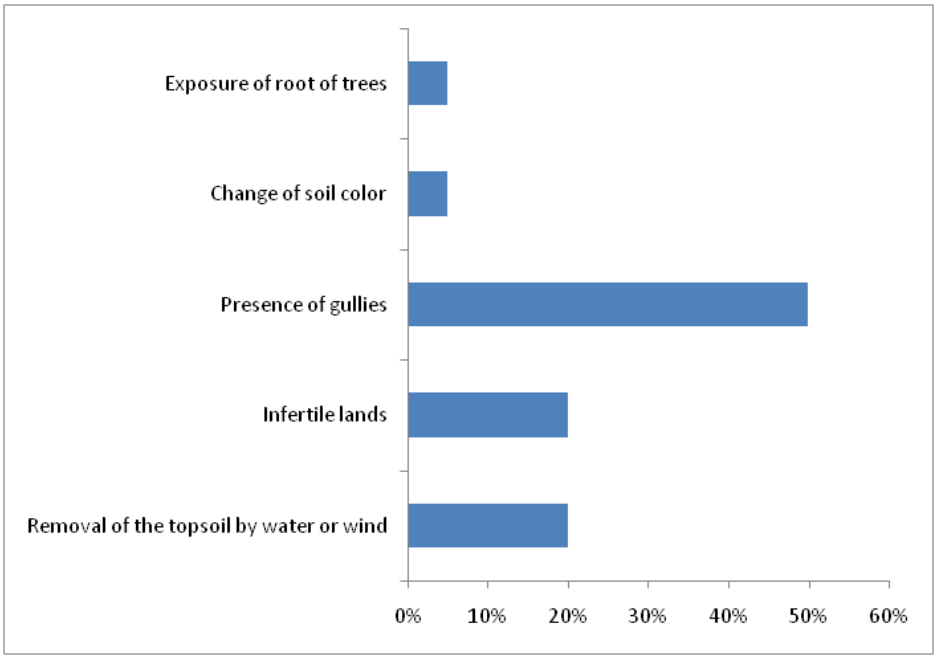
The various conservation methods adopted by farmers

During the survey, the farmers have a strong perception towards adoption of the conservation methods and also believe that the adoption of this conservation methods helps to control erosion, increase yield, increase land value, increase nutrient and retain moisture. The conservation methods adopted by the farmers include;

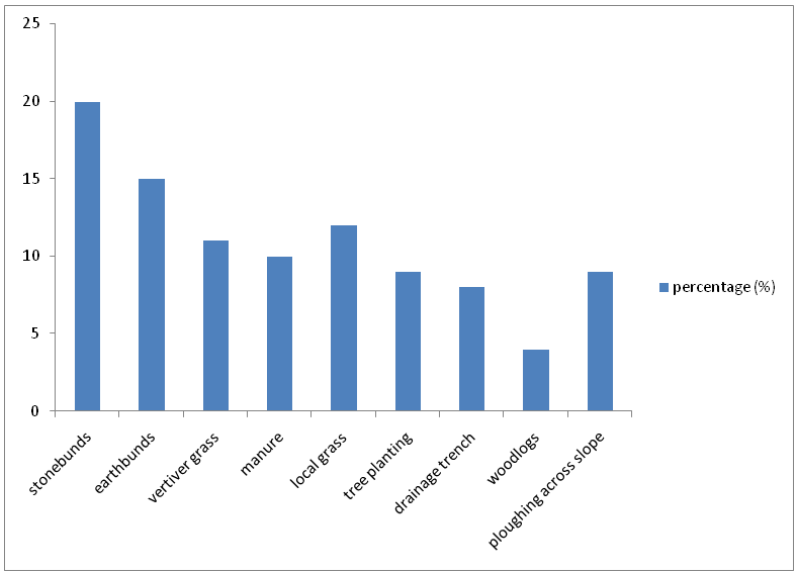
Table 1. Socio-economic characteristics of respondence

Variables	Frequency	Percentages (%)
Gender		
Male	79	79
Female	21	21
Total	100	100
Age(years)		
21-30	16	16
31-40	44	44
>40	40	40
Total	100	
Land ownership		
Own land	70	70
Rent	30	30
Total	100	100
Kind of labour		
Hired labour	41	41
Family labour	30	30
Both	29	29
Total	100	100
Source of finance		
Financial institution	7	7
Relatives or friends	3	3
Traditional money lenders	1	1
self	89	89
total	100	100

Source: Field survey, 2014



Source: field Survey: 2014.
Figure 1: Indicators of Soil Erosion Problem



Source: field survey, 2014
Figure 2. Various conservation methods adopted by farmers

Figure 3: Photo 1. shows stonebunds, source: field survey, 2014.

stonebunds, earthbunds, vertiver grass, manure, local grass, tree planting, drainage trench, wood logs and ploughing across slope. Among the conservation methods adopted by the farmers, stonebunds has the highest percentage 20%, followed by earthbunds 15%, vertiver grass 12%, manure 10%, local grass 12%, tree planting 9%, drainage trench 8%, wood logs 4% and ploughing across slope 9% as shown in Figure 2.

Description of the various conservation methods

Stonebunds and Earthbunds

It is an embankment or ridge build across a slope along the contour. Earthbunds are made of soil or mud. On moderately sloping areas the farmers construct the soil and stonebunds for erosion control but most of the time the farmers in the study area use stonebunds instead of earthbunds structure as the is the availability of stones more than soil but if the is shortage of stones, the farmers use earthbunds to control erosion. The photo 1below shows the structure of a stonebunds being adopted among farmers in the study area. Figure 3

Vertiver grass

Vertiver grass has a deep root that binds the soil together and therefore prevents soil loss and water runoff. Apart

Figure 4: Photo 2. shows vertiver grass, source: field survey, 2014.

Table 2. Constraints in the adoption of soil conservation technologies

Constraints	Frequency	Percentage (%)
Insufficient credit	30	30
Prices of inputs being high	10	10
Insufficient information on possible practices	11	11
Insufficient practical help	9	9
Insufficient support from family/friends to help in adoption	12	12
Land tenure	8	8
Insufficient material	20	20
total	100	100

Source: field survey, 2014

from stonebunds adopted by farmers in the study area, the farmers also use vertiver grass as a means of controlling erosion since less labor is required in its planting than constructing stonebunds.The photo 2 below shows vertiver grass being grown among farmers in the study area. Figure 4

Manure

Manure is an organic material that is used to fertilize the land. Farmers in the study area usually use feces and urine of domestic livestock with or without accompanying litter such as straw, hay or burning to apply to their land.

Constraints in adoption of the conservation methods

From Table 2, insufficient credit recorded the highest percentage 30% which implies that it is the most serious problem faced by the farmers, prices of inputs being high and the other problems were also notified by the farmers that hindered their of adoption of stonebunds, earthbunds, vertiver grass and manure, local grass, wood logs, drainage trench, tree planting and ploughing across slope. Followed by insufficient material (20%), insufficient support from family/friends to help in adoption (12%), insufficient information on possible practices (11%), prices of inputs being high (10%), insufficient practical help (9%) and land tenure (8%).

CONCLUSION

In the study, Male's form 79% of the respondents and 21% were females. Stonebunds, earthbunds, vertiver grass, manure, local grass, wood logs, drainage trench, and tree planting and ploughing across slopes were the various conservation methods adopted by the farmers. Among the conservation methods adopted by the farmers, stonebunds has the highest percentage 20%, followed by earthbunds 15%, vertiver grass 12%, manure 10%, local grass 12%, tree planting 9%, drainage trench 8%, wood logs 4% and ploughing across slope 9%.The

perceptions of farmers on the causes of erosion in the study area are: high intensity of rainfall, inadequate vegetation cover, deforestation and lack of proper conservation methods. The indicators of soil erosion problems in the study are farmers reported presence of gullies (45%) making it impossible for profitable cultivation, 20% said removal of the top soil by water or wind, 20% reported that it makes the land infertile, 5% as exposure of the root of trees and finally change of soil color as 5%. , insufficient credit has the highest percentage 30% which indicate that it is the most serious problem faced by the farmers, prices of inputs being high and the other constraints were also identified by the farmers as the most serious problem that affect their rate of adoption of stonebunds, earthbunds, vertiver grass and manure, local grass, wood logs, drainage trench, tree planting and ploughing across slope. Followed by insufficient material20%, insufficient support from family/friends to help in adoption 12%, insufficient information on possible practices (11%), prices of inputs being high (10%), insufficient practical help (9%) and land tenure (8%).

ACKNOWLEDGEMENT

The authors wish to acknowledge the Director and Staff of the Ministry of Food and Agriculture (MOFA), Bolgatanga for providing us with the necessary information for the study. We thank Mr. Suleiman Mathew, the Technical Officer of MOFA at Bolgatanga for helping us during our data collection. To the Staff of the Department of Soil and Water Management at Ministry of Food and Agriculture, God richly bless you for the kind assistance given to us during our data collection

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Vol. 3(5), pp. 102-106, May 2015
DOI: 10.14662/ARJASR2015.012

ISSN: 2360-7874
http://www.academicresearchjournals.org/ARJASR/Index.htm

Academic Research Journal of Agricultural Science and Research

Full Length Research

Temporal Production Trend for Selected Non-tradable Staples in Kassena- Nankana East District of Upper East Region of Ghana: The Case of Major Cereal Food Crops

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Accepted 22 March 2015

This study examines the production trend for maize, millet and rice in the Kassena Nankana East District between 2001 and 2013. The production of maize starts to increase between 2001 and 2002 and a marginal decrease (-3%) between 2002 and 2003 and reduce drastically (-51%) between 2004 and 2005. Production for millet starts to decrease between 2001 and 2005 and a marginal increase (84%) between 2009 and 2010 and reduced drastically (-78%) between 2010 and 2011. The production of rice starts to decrease (-52%) between 2001 and 2010 and a marginal decrease of production from 40,000Mt to 10,000Mt between 2012 and 2013. The lowest production of maize was in 2013 (10,000Mt). On the other hand, rice and millet production recorded maximum of 45,000Mt and 12,000Mt between 2011 and 2009 respectively. The area allocated for maize and rice cultivation consistently remained above 20,000ha and maize reaches its highest peak of 30,000ha and rice 25,000ha. The rate of growth also remained stable for millet from 2001 to 2009. The trends reflect the relative importance of the crops in the Ghanaian food system.

Keywords: Production, trend, cereals, marginal, guinea savannah

INTRODUCTION

Agriculture is the backbone of the Ghanaian economy and a major foreign exchange earner. It contributes about 35% GDP, employs 55% of the population on a formal and informal basis and contributes about 45% of all export earnings. With a land area of some 240,000 square kilometers, Ghana produces a variety of crops in its three climatic zones, which range from dry savannah in the north through transitional to wet forest, which run in east-west bands. Annual rainfall varies between 800mm and 2,400mm, generally decreasing from south to north and from west to east (Ghana National Commission for UNESCO, 2015).

The agricultural sector is made up of five major sub sectors-food crops, livestock, fisheries, cocoa and forestry. The aim of the sector is to ensure food security and facilitate the production of agricultural raw materials for industry and agricultural commodities for export (Zakaria et al., 2014). Agriculture is predominantly

practiced on small-holder; family-operated farms of 6.2% in 2009, driven largely on account of good rainfall patterns, good growth in the cocoa sub sector and by extension of the land under cultivation, suggesting that the sector can indeed be a driver of growth when the conditions are right. The forestry and logging sub-sector grew by 3.5% while the fishing sub-sector grew by 5% (Ghana National Commission for UNESCO, 2015).

Ghana's agricultural production meets only 50% of domestic cereals and meat needs, 60% of domestic fish consumption and less than 30% of the raw materials needed for agro-based industries. The level of self-sufficiency in food items varies from about 30% rice to 92% for maize. The main food crops grown in the country include cassava, yams, plantains, maize, rice, peanuts, millet and sorghum (Zakaria et al., 2014).

Maize is a heavy feeder and a top staple cereal crop in sub-Saharan Africa. In the past two decades, maize has spread rapidly into the moist Savannas of West Africa, replacing traditional cereal crops such as sorghum and millet particularly in areas with good access to fertilizer inputs and markets. In the West Africa moist Savannas, higher radiation levels, lower night temperatures and a reduced incidence of diseases and insect pests have helped to increase maize yield potentials compared with traditional areas for maize cultivation (Kamara, 2013).

Cereal (maize, millet and rice) production in the Savannas is faced with several production constraints which limit productivity. Poor soil fertility, drought combined can reduce on farm yield by over 70% even with the use of high-yielding varieties. Land-use intensification in the Northern Guinea Savanna has resulted in serious land degradation and nutrient depletion (Oikeh et al., 2003). Nitrogen is the nutrient most deficient in the soils and it most often limits cereal yield (Carsky and Iwuafor, 1995). Unfortunately, due to high cost and poor infrastructure, the availability of N fertilizers is limited.

The problem of poor soil fertility in the Guinea Savanna is compounded by recurrent drought at various stages of crop growth. For maize, drought at the flowering and grain-filling stages can cause serious yield losses (Grant et al., 1999). This indicates that farmers' fields are rarely characterized by only one biotic stress. It would therefore be desirable to increase the tolerance of crops to several stresses that occur in the target environment (Kamara, 2013. This study examines the production trend for maize, millet and rice in the Kassena Nankana East District between 2001 and 2013.

MATERIALS AND METHODS

Description of the study area

The Kassena Nankana East District lies within the Guinea Savanna woodlands. It is one of the nine Districts in Upper East Region. The district is generally low-lying. The main type of soil present within the district namely, the Savannah ochrosols and groundwater laterite. The northern and eastern parts of the district are covered by the Savannah ochrosols (porous, well drained, loamy and mildly acidic and interspersed with patches of black or dark-grey clay soils), while the rest of the district has groundwater laterite (are developed mainly over shale and granite and covers approximately 60% of the district land area) (MoFA, 2015).

Data Type, Source, Sampling and Analysis

A descriptive analysis of production trends was carried out using food production estimates for selected food crops from Ministry of Food and Agriculture, Kassena Nankana District of Ghana between 2001 and 2013 for three major cereals which include maize, millet and rice and cultivated land areas in hectares (Ha) between 2001 and 2013 for the three cereal crops. These food items were selected because; they account for a large share of overall household food budgets in Ghana. At the national level, cereals constitute the highest share of the overall food budget in all localities (Fearson, 2013) and descriptive statistics was used in describing the socio-economic characteristics of household. Secondary sources include published and unpublished information about the study area and from the internet.

RESULTS AND DISCUSSION

The population of the people from 2000 population and housing census was estimated to be 79,187. The sex composition of the districts population favors female. The female population forms a little over one-half of the total population of the district. The female population was estimated to be 40,940 representing 51.7% while the male recorded 38,247 representing 48.3% of the population (MoFA, 2015). The age of the household below 15 was estimated to be 9,504 representing 12% while age above 65 was estimated to be 69,683 representing 88%. The labour employed include family estimated to be 47,512 representing 60% while casual labour recorded 31,675 representing 40% (Table 1)

Production Trend for the Selected Food Crops

Figure 1 below shows the production trend for the selected food crops in Kassena Nankana East District of Ghana between 2001 and 2013 which include maize, millet and rice and the x-axis represents the production year and y-axis represents production in metric tons It

Table1. Personal and household characteristic of household

Socio-economic characteristics of household	Frequency	Percentage
Gender		
Male	38,247	48.3
Female	40,940	51.7
Age		
Below 15	9504	12
Above 65	69,683	88
Labour		
Family	47,512	60
Casual	31675	40

Source: MoFA, 2015

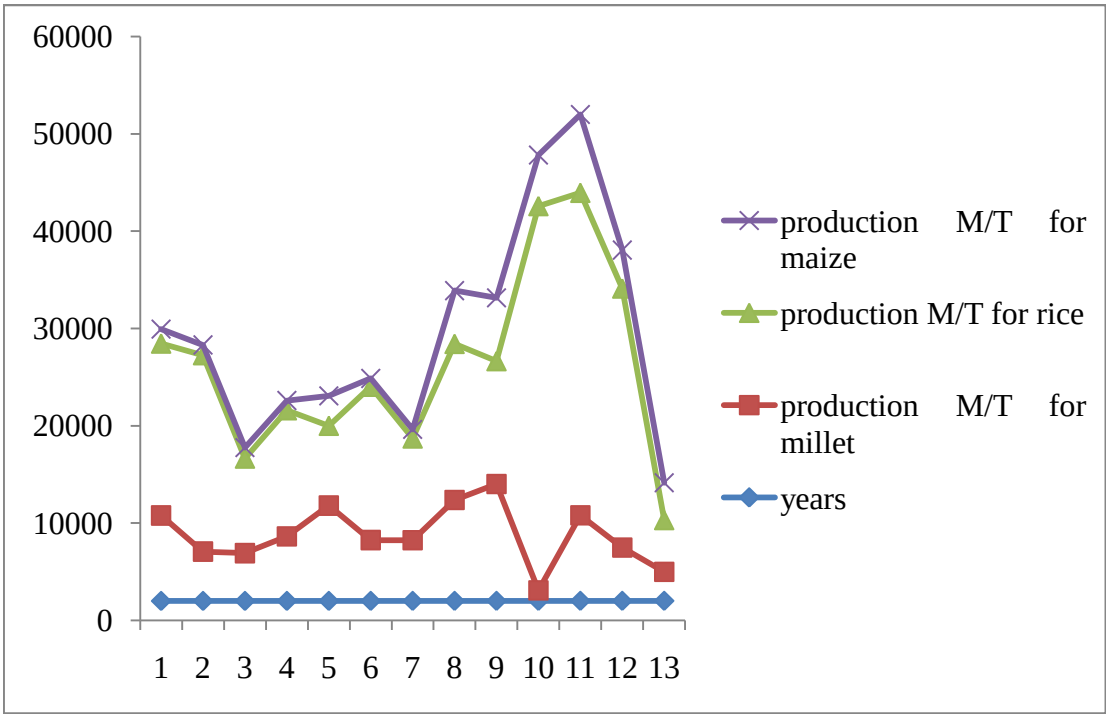

Figure1. Production trends for the selected food crops in Kassena Nankana East District of Ghana (2001- 2013).

can be seen from the Figure 1.

The production of maize starts to increase between 2001 and 2002 and a marginal decrease (-3%) between 2002 and 2003, (-5%) between 2006 and 2007 and reduced drastically (-51%) between 2004 and 2005, (-71%) between2007 and 2008 and marginal increase (34%) between 2011 and 2012 and marginal decrease (1.5%) between 2012 and 2013.

Production for millet starts to decrease between 2001 and 2005 and marginal increase (84%) between 2009 and 2010 and reduced drastically (-78%) between 2010 and 2011 and a proportionate increase (30%) between 2012 and 2013.

The production of rice starts to decrease (-52%) between 2001 and 2010 and a marginal decrease of production from 40,000Mt to 10,000Mt between 2012 and 2013. The lowest production of maize was in 2013 (10,000Mt). On the other hand, rice and millet production recorded maximum of 45,000Mt and 12,000Mt between 2011 and 2009 respectively. The trends reflect the relative

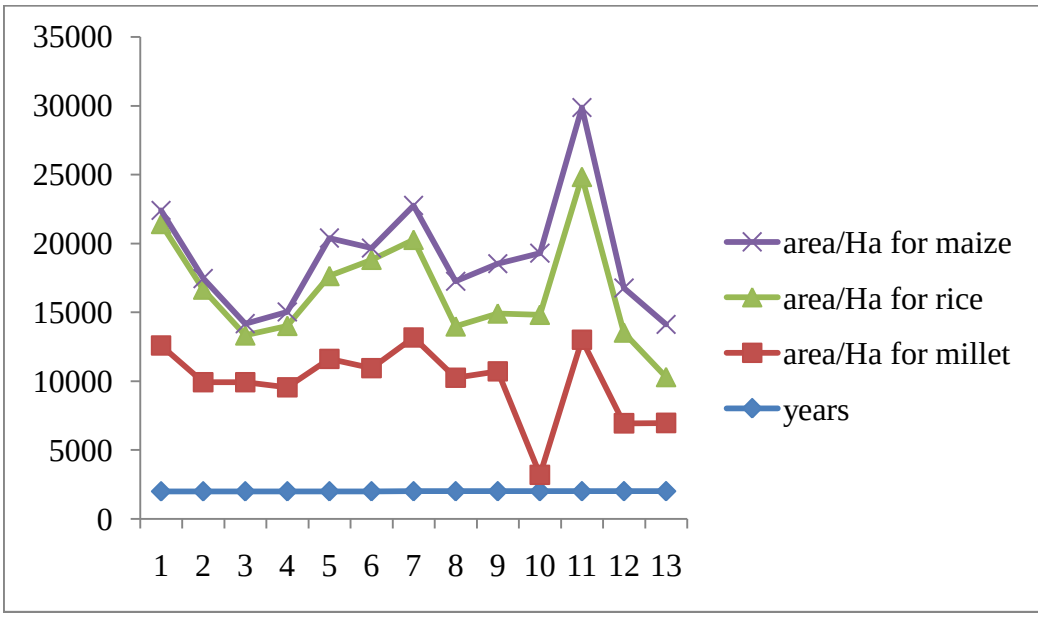

Figure 2. Trends in area cultivated for the selected food crops in Kassena Nankana East District of Ghana (2001-2013).

importance of the crops in the Ghanaian food system. The decrease in maize, millet and rice production could be attributed to poor fertility, drought, land degradation and nutrient depletion.

Trends in Area Cultivated for the Selected Food Crops

Figure 2 shows the trend in area expansion for maize, millet and rice in Kassena Nankana East District of Ghana between 2001 and 2013 and the x-axis represents the production year and y-axis represents area cultivated in hectares The area allocated for maize and rice cultivation consistently remained above 20,000ha and maize reaches its highest peak of 30,000ha rice 25,000ha and millet above 10,000ha. The rate of growth also remained stable for millet between 2001 and 2009. There is marginal decline for millet (-11%) between 2006 and 2007 and (-12%) decline between 2004 and 2005 and reduced drastically (-80%) between 2009 and 2010 while increasing for maize between 2010 and2011 and an increase for rice between 2010 and 2011.

CONCLUSION AND RECOMMENDATION

The study reveals the production and area trends of the selected food crops from Kassena Nankana East District of Ghana between 2001 and 2013.The production of maize starts to increase between 2001 and 2002 and marginal decrease (-3%) between 2002 and 2003and reduced drastically (-51%) between 2004 and2005. Production for millet starts to decrease between 2001 and 2005 and an increase (84%) between 2009 and 2010 and reduced drastically (-78%) between 2010 and 2011. The production of rice starts to decrease (-52%) between 2001 and 2010 and a decrease in production from 40,000Mt to 10,000Mt between 2012 and 2013. The lowest production of maize was in 2013 (10,000Mt). On the other hand, rice and millet production recorded maximum of 45,000Mt and 12,000Mt between 2011 and 2009 respectively. The area allocated for maize and rice cultivation consistently remained above 20,000ha and maize reaches its highest peak of 30,000ha and rice 25,000ha. The rate of growth also remained stable for millet between 2001 and 2009. The trends reflect the relative importance of the crops in the Ghanaian food system.

In view of the findings, there is the need for the district to take advantage and increase production for both domestic and external markets.

AKNOWLEDGEMENT

The authors wish to thank the Ministry of Food and Agriculture (MoFA), Kassena Nankana East District for providing us with the necessary information and to all those who contributed to the success of these research. May God the Almighty richly bless you for your time and patience.

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