academicresearchJournals

Vol. 3(5), pp. 86-91, May 2015
DOI: 10.14662/ARJASR2015.009
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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 mean 225.50 for output of adopters of manure 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 manure had higher 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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