

Awareness of Integrated Soil Fertility Management Practices in the Savelugu Municipal of the Northern Region of Ghana

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Abstract. In sub-Saharan Africa intensifying small-scale farming is essential in addressing poverty related issues in rural communities and the degradation of natural resources. Integrated Soil Fertility Management (ISFM) are the best practices used to improve the productivity of crops whilst maximizing agronomic efficiency of inputs applied and hence contributing to sustainable intensification. ISFM usually include the appropriate use of inorganic fertilizer and organic resources, good agronomic practices and appropriate use of germplasm. The survey was carried-out on the awareness of Integrated Soil Fertility Management practices in the Savelugu Municipal of Northern Ghana to study the awareness of integrated soil fertility management practices amongst farmers through the administration of questionnaires. A multistage method of sampling was used in selecting thirty (30) respondents randomly from five (5) selected communities namely Jana, Yapalsi, Diari, Nabogu and Gushie to make up a total sample size of 150 respondents. Frequency distribution and percentages were used to represent the data. Correlation analysis was used to test for the relationship between awareness, educational level and household size. The survey showed that majority of the respondents at ages between 21 and 30 years were married and majority with household size of 3 to 5 as well as primary and secondary education. Farming activities were carried-out by hand (80%). Majority of the respondents (43.3%) were informed about ISFM through demonstrations and 20% of the farmers apply inorganic fertilizer. About 85.5% of the respondents were aware of ISFM. The research also revealed that ISFM improves production and supports finances of respondents. The assessment of respondents' perception of ISFM revealed a positive agreement of the effect of ISFM on soil health as well as improved production. In conclusion, it is thus suggested that it is needful for the involvement of the government on the adoption of ISFM via Non-Governmental Organisations (NGOs) locally and or internationally for a suitable advancement and to guarantee a sustainable environment with a world-wide corporation for improvement.

Keywords: integrated soil fertility management; farmers, awareness, Savelugu municipal, innovation.

Introduction

In Africa, the prominence of agriculture to national economies and livelihood of farmers remains a key motivating force for the determination of promoting sustainable intensification (Tittone & Giller, 2013; Vanlauwe *et al.*, 2015). It is acknowledged that numerous soils in Africa are regarded as naturally low in soil fertility largely owing to absence of volcanic transformation as well as the depletion of nutrients, a

difficulty intensified by exceptionally scanty fertilizer usage (Bationo *et al.*, 2012).

Dwindling size of land in parts of Africa has ensued in uninterrupted cultivation of the same piece of land and accordingly causing the lessening of vital nutrients in the soil, degrading land and inadequate output. This demands for new sustainable methods of agriculture to elevate or sustain and not the exploitation of soil productivity.

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Integrated Soil Fertility Management (ISFM) is an example of such technique and it targets to take into accounts the arrangement of often site specific, biotic factors, physio-chemical, socio-economics and administrative procedures that concludes the usefulness of soil fertility management (Bationo *et al.*, 2012). Yet, innovation of systems comprising of ISFM, agroforestry practices and conservation agriculture are complex, require in-depth information and embroils risks which repeatedly leads to low adoption.

The little awareness of ISFM is repeatedly as a consequences of communication breaches between small-scale farmers and agriculture investors (Mashavave *et al.*, 2013). Initial prototypes of innovation diffusion such as the linear and induced innovation models were focused on conveying technologies to farmers failed to advance agricultural productivity (Pamuk, Bulte & Adekunle, 2014). Regrettably agriculturist, policy makers and development agents constantly support these approaches regardless of their limitations (Friederichsen *et al.*, 2013). Current innovation system methods are naturally systemic and usually highlights cooperative learning amongst various actors in an agriculture structure to deliver numerous lanes for unravelling problems (Klerkx, van Mierlo & Leeuwis, 2012). Therefore, they are regarded as a practicable way of endorsing innovations in small-scale farming.

There are few documentations associated with the awareness of ISFM in the northern part of Ghana. Also, earlier surveys have not sufficiently clarified the impact of diverse measurement on the awareness of soil fertility innovations.

Therefore, there is the need to study the awareness of Integrated Soil Fertility Management Practices among farmers in the Savelugu Municipal of the Northern Region of Ghana.

Materials and Methods

Savelugu-Nanton lies between latitude 9° 28'' N and 10° 08'' N and longitude 0° 39'' W and 1° 02'' W. The districts boundary to the east and west are the Gushiegu/ Karaga and Tolon-Kumbungu district respectively.

Savelugu has a tropical climate characterised by wet and dry seasons. The temperature is between 25 °C to 28 °C. The soils have low organic matter content, high levels of iron concretions, susceptible to severe erosion and are generally sandy-loam in texture. The key crops cultivated in the area are yam, maize, rice, groundnut and vegetables (Ghana Statistical Service, 2014).

Data for the study were collected from both primary and secondary sources. The semi structured

questionnaires were used to conduct household survey. The data collected included information on demographic and socio-economic characteristics, various methods of farming operations practiced by farmers and farmers' awareness and perceptions about ISFM. Six experienced enumerators, who know the study area and understand the communities' language were recruited and trained for three days by the researcher. Pretesting of questionnaires was done by administering it to selected twenty respondents. The results found from the pretest enabled the researcher to make changes on the questionnaire. In this study, five focus group discussions consist six to ten participants farmers who were selected randomly conducted in the study area. The FGDs were conducted in order to get some in-detail information on ISFM practices, community awareness and perceptions on ISFM practices. The key subject which was discovered in the group discussion includes: the extent of the farmers' participation in the ISFM practices in reference to their awareness and perception of poor soil fertility, and the effectiveness of the technologies under implementation. Here the researcher was limited to facilitating the discussion using a checklist of topics to guide the sessions in an orderly way. These informal techniques helped to acquire useful and detailed information, which would have been difficult to collect through the questionnaire interview.

Field observation was conducted throughout the whole process of the research in order to ensure the validity of information obtained from the farmers through interview schedule. This helped to capture some points that were not clearly obtained from the interview.

Furthermore, field notes, portable tape recorders were used to document important observations such as gestures and body language to enrich the transcripts

A multistage sampling technique was employed for this study. Firstly, Savelugu municipal was purposively selected because it is one of the areas in Northern Ghana in terms of poor soil fertility levels. Secondly five communities were randomly selected namely Jana, Yapalsi, Diari, Nabogu and Gushie. These communities selected were proportional to the land area covered by each class and the number of households selected in each community was proportional to the number of households in each community. In this way, thirty respondents were randomly selected from the five selected communities to make up a total sample size of 150 respondents. Marshal *et al.* (2013) recommend that 15-30 respondents as a sample size is perfect for a case study procedure for a research to reach theoretical saturation.

The study was carried-out between June and September, 2019.

Table 1

Respondents characteristics in the Savelugu municipal (N=150)

Age	Frequency	Percent (%)
>20yrs	22	14.7
Between 21- 30yrs	78	52.0
31-40yrs	18	12.0
41-50yrs	20	13.3
60+	12	8.0
Total	150	100
Household size	Frequency	Percent (%)
>3 persons	36	24.0
3-5 persons	74	49.3
Above 5 persons	40	26.7
Total	150	100
Marital status	Frequency	Percent (%)
Single	29	19.3
Married	108	72.0
Separate	4	2.7
Divorced	3	2.0
Windowed	6	4.0
Total	150	100
Educational level	Frequency	Percent (%)
No formal education	20	13.3
Primary education	105	70.0
Secondary education	16	10.7
others	9	6.0
Total	150	100

Source: Field Survey, 2019.

The data collected was analyzed using descriptive statistics that comprised the use of frequency distribution and percentages. Correlation analysis was used to test for the relationship between awareness, sex, educational level, marital status and household size. Statistical Package for Social Science (SPSS) software version 16.0 was used to organize, code, clear and analyze data collected through survey.

Results

Socio-economic Characteristics of Savelugu Municipal

The results in Table 1 indicate that mainstream of the respondents (52%) were within the age range of 21-30 years. This shows that most respondents are within the active age to adopt new innovations which can advance the imminent generation to boost

sustainability. Respondents of household size of 3-5 persons represented 49.3% and 72% were married. This shows that respondents were highly responsible individuals.

Majority (70%) of the respondents have obtained their primary education and 10% of the respondents have secondary education. This indicates that the 80.6% of the respondents have acquired some form of education and can adopt to any innovation to improve on soil health. Whilst 13.3% and 6% of the respondents have no formal education and other form of education respectively.

Distribution of Respondent's Methods of Farming Operation

The results (Table 2) indicate that 80% of the respondents practice manual farming and are well educated; this drives their need to improve their

farming activities. 13.3% of the respondents do not use any form of innovation in their farming activities which could largely be due to constraints in finance. Approximately 20% of the respondents rely on inorganic fertilizers whilst 38% of the respondents - on organic materials in their farming activities. Other form of innovations used by the respondents was timing of fertilizer application (13.3%), agroforestry (6%), improved germplasm (6%) and recommended spacing (3.3%).

Distribution of Respondents' Awareness of Integrated Soil Fertility Management

Table 3 shows that a majority (85.3%) of the respondents was aware of ISFM whilst 14.7 % of the

respondents were not aware of ISFM. The respondents were informed of ISFM through Demonstrations (43.3%) whilst others were informed through NGOs (4%), Friends (16.7%) and Radio (36%).

Perception of Respondents about Integrated Soil Fertility Management

Table 4 shows that about 65.5% of respondents strongly agreed that ISFM involves the use of organic residues and fertilizers. Some (15.3%) of the respondents strongly disagreed that that ISFM involves the use of organic residues and fertilizers whilst 6% of the respondents were neutral that ISFM involves the use of organic residues and fertilizers and 13.3% of the respondents disagreed

Table 2

Distribution of respondents established by the method of farm operation (N= 150)

Methods of farming	Frequency	Percent (%)
By hand	120	80
Partly- mechanical	30	20
Total	150	100
Innovation used by the farmer	Frequency	Percent (%)
None	20	13.3
Agroforestry	9	6.0
Inorganic fertilizer	30	20.0
Timing of fertilizer application	20	13.3
Manure/organic materials/compost	57	38.0
Recommended spacing	5	3.3
Improved germplasm	9	6.0
Total	150	99.9

Source: Field Survey, 2019.

Table 3

Distribution of respondents awareness of integrated soil fertility management (N=150)

Awareness of Integrated Soil Fertility Management	Frequency	Percent (%)
Yes	128	85.3
No	22	14.7
Total	150	100
Source of awareness of Integrated Fertilizer Management	Frequency	Percent (%)
Demonstrations	65	43.3
Non-Governmental Organisations (NGOs)	6	4.0
Friends	25	16.7
Radio	54	36.0
Total	150	99.7

Source: Field Survey, 2019.

Table 4

Perception of respondents about Integrated Fertilizer Management (N=150)

Statement	(1) Strongly agree		(2) Neutral		(3) Disagree		(4) Strongly disagree	
	F	%	F	%	F	%	F	%
Integrated soil fertility management practices involve the use of organic residues and chemical fertilizer	98	65.3	9	6	20	13.3	23	15.3
Organic residues are readily available and left unused	102	68	27	18	12	8	9	6
Organic residues contain nutrients	100	66.7	32	21.3	9	6	9	6
Organic residues help improve production	106	70.7	22	14.7	15	10	7	4.6
Integrated soil fertility management improves soil fertility levels	103	68.6	24	16	16	10.7	7	4.7

F (Frequency), % (Percentage)

1(Strongly agree), 2 (Neutral), 3 (Disagree), 4 (Strongly disagree)

Source: Field Survey, 2019.

Table 5

Correlation result of awareness of integrated soil fertility management and socio – economic characteristics (N=150)

Correlation	R value	P value	Significance
Educational level against awareness	0.185	0.005	S
Household size against awareness	0.041	0.428	NS

Correlation is significant at 5% probability level

S (significant), NS (not significant)

Source: Field Survey, 2019.

that ISFM involves the use of organic residues and fertilizers.

68% of respondents strongly agreed that organic residues are readily available and left unused, and 6% of the respondents strongly disagreed that organic residues are readily available and left unused whilst 18% of the respondents were neutral that organic residues are readily available and left unused. 6% of the respondents disagreed that organic residues are readily available and left unused.

Another 66.7% of respondents strongly agreed that organic residues contain nutrients and 6% of the respondents strongly disagreed that organic residues contain nutrients whilst 21.3% of the respondents were neutral that organic residues contain nutrients. 6% of the respondents disagreed that organic residues contain nutrients.

Also, 70.7% of respondents strongly agreed that organic residues help improve production and 4.6% of the respondents strongly disagreed that organic residues help improve production whilst 14.7% of the

respondents were neutral that organic residues help improve production. 10% of the respondents disagreed that organic residues help improve production.

However, 68.6% of respondents strongly agreed that ISFM improves soil fertility, and 4.7% of the respondents strongly disagreed that ISFM improves soil fertility levels whilst 16% of the respondents were neutral that ISFM improves soil fertility levels. 10.7% of the respondents disagreed that ISFM improves soil fertility levels.

Relationship of Awareness of Integrated Soil Fertility Management and Socio-economic Characteristics

The correlation result on educational level against awareness educational level and the awareness of ISFM showed a significant level of 0.005 and household size against and awareness were not significant with p value of 0.428.

Discussion

The survey identified the socio-economic characteristic of Savelugu Municipality and largely,

the results indicated that educational level of the respondents significantly influenced their awareness of ISFM. Majority of the respondents who used two or more ISFM practices were respondents who had acquired primary and secondary education. For instance, one of the respondents who had attained his secondary education was practicing agroforestry because he learned it at school. The respondent indicated that "I learnt that establishing leguminous trees on farmland helps improve soil fertility levels because of their ability to fix nitrogen to the soil and also their leaves can be cut and incorporated into the soil to decompose to improve soil health to support the growth of crops.

The methods of farm operation clearly show that respondents in the Savelugu-Nanton district use some form of innovation to improve on productivity. Thus, some rudiments of ISFM are already practiced locally in the district.

Respondents were aware of ISFM in the Savelugu Municipality and the sources information on ISFM was through field demonstrations influence the respondent's adoption decisions. In these communities, respondents frequently visit each other and co-operate with extension officers to obtain new information connected to the intended practice to be adopted. Various respondents desired applying new practices on their farms prior to adoption. Several of the respondents are threat unfriendly and are merely prepared to adopt to practices within their means which would guarantee their accomplishment. The assertion by Lambrecht et al. (2014) indicates that farmers' association with the technical know-how example demonstrated by extension officers improves the diffusion of information that are technically needed for investigations. These investigations enable farmers to improve further accurate prospects on the new innovation which could improve continuous adoption by farmers. These results underscore the importance of partaking in knowledge adoption. Likewise, majority of the respondents testified that attending field's demonstrations and radio talks significantly influenced respondent's awareness and their decisions to adopt ISFM, predominantly the use of crop residues and mineral fertilizers.

Pulido and Bocco (2014) stated that the awareness of soil degradation as a problem by farmers is the primary phase in influencing their judgements about ISFM. As such farmers become motivated to pursue different means to forestall present difficulties founded on many perceived limitations comprising of the characteristics of technologies accessible to them. Progressively by this idea, farmers that have robust sense of the basis and result of soil degradation in their locations have influenced them to accept new innovations.

Farmers stated that uninterrupted farming and change in climate were perceived as important driving force to soil degradation, whilst abating crop yields and increased occurrence of pests and diseases remained the sudden costs they acknowledged. With this regard, farmers have embraced many ISFM practices which reflect animal manure, chemical fertilizers and traditional practices to improve productivity. Similar studies in Kenya by Mutuku *et al.* (2017) stated that small-scale farmers were willing to adopt new ISFM once they perceived soil fertility problems. This suggests that increasing the awareness on the decline in soil quality a key constraint in production could significantly improve the livelihood of small-scale farmers via training and other sensitization programmes could expedite acceptance. The more respondents are educated the further they would publicise information amongst respondents to increase awareness.

Conclusions

The survey revealed that about 85% respondents were aware of integrated soil fertility management. The majority of the respondents was aware of ISFM through field demonstrations. The majority of the respondents strongly agreed that ISFM can enhance crop productivity. The educated respondents had better access to information which further increased their awareness of ISFM. The household size, marital status and sex of respondents has a positive relationship on the awareness of ISFM. To effectively improve the awareness of integrated soil fertility management in Ghana, it is needful to add integrated soil fertility management practice education to already existing programmes both in secondary and tertiary institutions. Provision of funds by the government would enhance research at the tertiary level. Extension services ought to be enriched and armed to educate rural farmers on integrated soil fertility management. Training and capacity building programmes by research institutions, NGOs and largely the government ought to be invigorated.

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