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Organic Pest Management Practices and Soil Biodiversity Conservation in Budondo Sub County, Jinja District

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ABSTRACT

Biodiversity is at the verge of alarming decline globally, attributed to change in agricultural practices such as the use of inorganic pesticides. These agricultural practices have changed the distribution and quality of habitual biodiversity and their environment. A study of 340 households in Budondo Sub-County farming community, Jinja District revealed that pests destroyed their crops and caused significant yield losses. This was manifested in their score of responses viz. strongly agreed (1175) and strongly agreed (1075) respectively. Farmers demonstrated knowledge of soil macro fauna (96.2%), however, they claimed that termites and earthworms were pests (45.6%) because they ate and reduced their crop yield (86.8%) and constructed ant hills which were labourious to dig (60.3%). Farmers therefore sprayed their gardens with inorganic pesticides (81.8%) in order to eliminate pests quickly (86.5%). They also poisoned termites and earthworms with inorganic chemicals (77.9%) disregarding their long term economic benefits of decomposing organic matter and nutrient recycling among others. The study also revealed that organic pest management practices have not been adopted because of inadequate training, inadequate knowledge which was found significant at (χ^2 (77, n=340) =180.441, $p<$ .001) and attitude significant at (χ^2 (99, n=340) =161.511, $p<$ .001). The researcher therefore recommended the government of Uganda to make and adopt a policy and action plan on organic pest management for sustainable soil biodiversity conservation. Farmers in Budondo be sensitized and trained on how to mix plant extracts to form organic pesticides if any conservation measures were to be attained.

Key words: Soil, biodiversity, conservation, organic, inorganic, pesticides, households.
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INTRODUCTION

Biodiversity, the diversity of genes, organisms and ecosystems (Blouin et al., 2013) is at decline in worldwide and at a global scale. Much of this loss can be attributed to change by human agricultural activities (Hole, 2005). Soil biodiversity reflects the variability among living

organisms in the soil - ranging from the myriad of invisible microbes, bacteria and fungi to the more familiar macro-fauna such as earthworms and termites (Montanarella, 2016; Symondson, 2012).

The rapid growth of biodiversity started 540 years ago following 3.5 billion years of evolution (Sahney, Benton, & Falcon-Lang, 2010). It comprises of planned biodiversity (crops and livestock that the farmer wishes to produce) and unplanned biodiversity (all other biota in and entering the system) (Brussaard, de Ruiter, & Brown, 2007). Farmers plan biodiversity by applying a multitude of management practices which include agrochemical application and burning which change the distribution and quality of available habitat and resources both for plants and other biodiversity. Since before 2000 BC, humans have utilized pesticides to protect their crops against pests and this has since increased dramatically over the past 60 years (Isenring, 2010; Koul, 2012).

In Africa, agriculture is one of the major threats of biodiversity (Sileshi, Akinnifesi, Ajayi, Mng, & Nyoka, 2016). There is a growing realization worldwide that biodiversity is fundamental for agricultural production and food security as well as environmental conservation, which human wellbeing depends on (Thrupp, 2000). Therefore, his war against biodiversity is inevitably war against himself.

Several approaches to the intervention of pest management include cultural, biological, physical and chemical pest control measures. Pesticides though effective for the job but is broad spectrum rather than target oriented(Gurr, Wratten, & Snyder, 2012). Pesticides affect biological diversity, along with habitat loss and climate change. They have toxic effects in the short term on directly exposed organisms or long-term effects by causing changes in habitat and the food chain (Isenring, 2010). For example insecticides kill insect pest, herbicides kill weeds, fungicides kill fungi, nematicides kill nematodes and termiticides kill termites (Manual, 2013).

In an awake to control garden pests and weeds in order to increase crop yields, farmers especially in Budondo Sub-County have increasingly used inorganic pesticides and herbicides respectively. However, the chemicals used are poisonous not only to pests but also to soil biodiversity. The inorganic chemicals reduce soil biodiversity population and impacting on the slow rate of soil nutrient recycling (fertility) and diversity degradation. Termite houses commonly known as anthills are left empty and road networks of termites, ants and earthworms are not commonly seen in Budondo Sub County due to inorganic pesticides.

Organic pest control methods are environmentally sound (Bengtsson, Ahnström, & Weibull, 2005). They generally exploit the specific strengths of the plants and the specific weaknesses of pests, rather than applying chemicals to which pests can eventually become resistant hence resulting in a crop that is arguably healthier, safer and more flavourful than its less labour-intensive counterpart. Measures of organic practices such as: use of preventive cultural practices which suppress the pest such as manipulation of crop rotations and strip-cropping; green manuring and organic fertilization (animal manure, compost, crop residues); mechanical control such as hand picking, minimum tillage; biological controls(e.g. the use of predators, such as birds, bats, reptiles, frogs and other insects) and avoidance of pesticides and herbicides use significantly increases the density and species of soil's life (FiBl, 2000). It is generally recognized that organic pest control increase biodiversity as compared to intensive agriculture which leads to leaching of nutrients and loss of inhabiting soil living organisms (Bengtsson et al., 2005).

However, these have received little attention (Winqvist, Ahnström, & Bengtsson, 2012) Agricultural practices affecting soil microorganisms are of particular interest (Eisenhauer et al., 2009). Thus, human survival is inextricably linked to the survival of numerous other species on which intact ecosystems depend (Isenring, 2010). Many of the problems in conserving biodiversity are associated with the lack of recognition of the importance it plays in agricultural production. Although many farmers and the farming community have a profound knowledge of their agriculture, training and education is often needed to highlight the roles of the soil biota at various levels of the ecosystem/landscape (Tukamushaba, Mugonola, Otieno, Bugenyi, & Kibikyo, 2016)

The researchers' specific objectives to this study were:

- To establish the level of organic pest management practices in Budondo Sub county
- To establish the level of soil biodiversity conservation in Budondo Sub county
- To relate organic pest management practices and soil biodiversity conservation in Budondo Sub County

Description of study area: Budondo is one of the 12 sub counties (6 rural and 6 urban) in Jinja District in Busoga region and in Uganda. It has five (5) parishes and a total of thirty eight (38) villages. It is located in Kagoma County along River Nile west of Jinja Town. It is about 10 Km from Jinja town. Budondo Sub county community has a total population of 45,035 male and female who live in 8502 households. The average household is 5.3 with an average land holding of 1.5 acre per household (Statistics, 2005).

MATERIALS AND METHODS

This was a case study conducted through a descriptive survey research design. It was concerned with establishing the relationship between organic pest management practices and conservation of soil biodiversity in Budondo Sub County, Jinja District.

Descriptive approach was used in order to gather information about the present existing condition and utilize observations in the study (Creswell, 2003). The research study partially based its findings through both quantitative research methods in order to permit a flexible and iterative approach. It also employed qualitative research method in order to find and build theories that would explain the relationship of one variable with another variable through qualitative elements in research (Atomica, 2010). A total of 340 respondents was randomly determined using a probabilistic sampling design specifically simple random sampling from 8502 household in Budondo Sub County chosen in line with Strydom and De Vos sample determination table (De Vos & Strydom, 1998).

Researchers used both administered questionnaire, interviews, observations and documentary analysis as the main tools for collecting data. They were concerned with views, perceptions, opinions, attitudes and behaviours of the respondents (Otieno, Buyinza, Kapiyo, & Oindo, 2013). Questionnaires were administered by the interviewer especially where concepts were difficult to interpret by farmer respondents. The data obtained through a questionnaire was similar to that obtained through an interview because of the open ended questions (Burns & Grove, 1993).

RESULTS AND DISCUSSIONS

Socio- demographic characteristics of respondents

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The socio-demographic characteristics of respondents were tabulated from questionnaires describing bio-data, education background and occupation of respondents in the five parishes of Budondo Sub-County (Table 1).

The mean age of 37.6 of household respondents authenticated the responses given the Ugandan age of consent of 18 years. This supports Segura et al (2004) who suggested that the youth emigrate from their farming communities and perhaps are less motivated to carry out farming. It also implies that pest management was carried out by the mature farmers who had knowledge and made farming decisions on the choice of farm inputs used (Lutap & Atis, 2013).

Table 1: Socio-demographic Characteristics of Respondents in Budondo Sub-County (N=340)

Characteristics	Frequency	Percentage
Age		
10-19	27	7.9
20-29	77	22.6
30-39	83	24
40-49	88	25.9
50-59	34	10.0
≥ 60	31	9.1
Mean	37.6	-
Sex		
Male	154	45.3
Female	186	57
Marital status		
Single	62	18.2
Married	199	58.5
Divorced	9	2.6
Widowed	51	15
Separated	19	5.6
Dependants		
1-5	145	42.6
6-10	140	41.2
11-15	40	11.8
≥ 16	15	4
Highest education level		
Primary	151	44
O' level	88	25.9
A' level	20	5.9
College/ University	12	3.5
Never to school	69	20.3
Occupation		
Farming	300	88.2
Trading	34	10
Civil servant	6	1.8
Working experience		
1-2 years	48	11
3-4 years	61	17.9
5-6 years	46	13.5
≥ 7 years	185	54
Parish		
Ivunamba	83	24
Namizi	73	21.5
Kibibi	74	21.8
Buwaji	63	18.5
Nawangoma	47	13.8

More than a half of respondents were female (57%) indicating gender sensitivity and farming dominance by female. Over a half of respondents were married (58.5%) and had over six dependants (57.4%) (Mal et al., 2009) (Table 1). This indicates that the most of households practiced farming to produce food to survive their household members and generate income to help them fulfill their needs and responsibilities (Mal et al., 2009) .

Over three quarters of household respondents (79.7%) attended formal education. This shows that they had the capacity to be sensitized about organic pest management practices and implement them effectively. The major economic activity in rural communities was farming. This is manifested by the majority of household respondents (88.2%) whose occupation was farming with over 5 years' experience (70.5%) (Table 1). The respondents (an average of 20%) were randomly selected from each of the five parishes that constitute Budondo Sub-County. This intended to ensure an equal representation of the study area.

From table 1, farming was the major occupation (88.2%) for the mature (mean age= 37.6) and married (58.5%) in Budondo Sub County. It was practiced to provide a source of food for survival and to sustain their families given a large number of household dependents of six and above. All the respondents were from parishes of Budondo Sub County and therefore were key stakeholders of the study.

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Over a half of respondents grew most of vegetables i.e. Cabbage (67.4%), Tomatoes (74%), Pumpkins (50.3%) and greens like dodo, sukuma etc. (87.1%) (Table 2). This was due to Budondo's conducive ecology for vegetable growing enhanced by her location near River Nile and proximity to Jinja town. Respondents revealed that Ginger farming (27.1%) had just been introduced in the area whereas Onions (38.8%) and Carrots (40.6%) were progressing due to increasing demand in and neighboring markets (Table 2). This was in line with Pophiwa who urged that there was a growing demand for food globally most especially organically produced (Pophiwa, 2012).

Maize was the dominant cereal crop grown in Budondo Sub-County as agreed by (97.6%) (Table 2). This was because maize is the traditional food and cash crop in the study area and promotes food security. There was also a high demand of maize by schools, prisons and neighborhood countries. Rice growing was represented by (36.5%), millet (24%) and Sorghum 7.4% possibly due to their unfavourable ecological environment in the study area. More than three quarters of respondents agreed that cassava (85.6%), sweet potatoes (93.8%) and yams (77.6%) were grown by the majority households. This indicated that farmers in Budondo value the traditional staple foods.

Pest management practices and peasantry

Table 2: Crops Grown in Budondo Sub-County (N=340)

Crops	Yes (%)	No (%)
Vegetables		
Cabbage	229 (67.4)	111 (32.6)
Carrots	138 (40.6)	202 (59.4)
Tomatoes	253 (74)	87 (25.6)
Onions	132 (38.8)	208 (61.2)
Pumpkins	171 (50.3)	169 (49.7)
Ginger	92 (27.1)	248 (72.9)
Greens	296 (87.1)	44 (12.9)
Other vegetables	23 (6.8)	317 (93.2)
Cereals		
Maize	332 (97.6)	8 (2.4)
Rice,	124 (36.5)	216 (63.5)
Millet	83 (24)	257 (75.6)
Sorghum	25 (7.4)	315 (92.6)
Other cereals	0 (0.0)	340 (100)
Root tubers		
Cassava	291 (85.6)	49 (14)
Sweet potatoes	319 (93.8)	21 (6.2)
Yams	264 (77.6)	76 (22.4)
Other root tubers	8 (2.4)	332 (97.6)
Fruits		
Banana	317 (93.2)	23 (6.8)
Pawpaw	215 (63.2)	125 (36.8)
Oranges	135 (39.7)	205 (60.3)
Jack fruit	287 (84)	53 (15.6)
Mangoes	251 (73.8)	89 (26.2)
Passion fruits	175 (51.5)	165 (48.5)
Pineapples	48 (11)	292 (85.9)
Other fruits	16 (7)	324 (95.3)
Legumes		
Ground nuts	304 (89.4)	36 (10.6)
Beans	329 (96.8)	11 (3.2)
Soya	259 (76.2)	81 (23.8)
Peas	36 (10.6)	304 (89.4)
Other legumes	19 (5.6)	321 (94)

Most households grow banana (93.2%), jack fruit (84%), mangoes (73.8%), pawpaw (63.2%) and passion fruits (51.5%) (Table 2). This was possibly due to high demand of fruits by urban dwellers around the study area. However, orange growing (39.7%) was still low while pineapple growing (11%) was left to isolated farmers possibly due to little awareness about their growing methods. Most of respondents agreed that legumes grown were beans (96.8%) followed by ground nuts (89.4%), and soya (76.2%). This is because they were consumed in different forms. Peas (10.6%) are grown by isolated farmers (Table 2) possibly due to little awareness about the value and growing methods of it.

Table 3: Knowledge about Pests in Budondo Sub-County (N=340)

Variables	Yes (%)	No (%)
Are you aware of pests	292 (85.9)	48 (11)
Pests		
Aphids	53 (15.6)	287 (84)
White flies	26 (7.6)	314 (92.4)

Mealy bugs	36 (10.6)	304 (89.4)
Termites	155 (45.6)	185 (54)
Cut worms	51 (15.0)	289 (85.0)
Stem borers	88 (25.9)	252 (71)
Hoppers and locusts	78 (22.9)	262 (77.1)
African boll worm	24 (7.1)	316 (92.9)
African army worm	24 (7.1)	316 (92.9)
Thrips	37 (10.9)	303 (89.1)
Leaf miners	60 (17.6)	280 (82.4)
White grabs	42 (12.4)	298 (87.6)
Others	182 (53.5)	158 (46.5)
Pest management practice		
Spray them using pesticides	278 (81.8)	62 (18.2)
Pick them by hands	48 (11)	292 (85.9)
Weed crops to prevent pests	113 (33.2)	227 (66.8)
Crop rotation	142 (41.8)	198 (58.2)
Intercropping	110 (32.4)	230 (67.6)
Spray using a mixture of any of urine, red pepper, neem, onions etc.	103 (30.3)	237 (69.7)
Use ash mixed with pepper and urine	112 (32.9)	228 (67.1)
Leave them	38 (11.2)	302 (88.8)
Any other	10 (2.9)	330 (97.1)

It was found out that (85.9%) of household respondents were aware of pests (Table 3), very few could identify aphids (15.6%), whiteflies (7.6%), mealy bugs (10.6%), cut worms (15%), stem borers (25.9%), hoppers and locusts (22.9%), african boll worm (7.1%), african army worm (7.1), thrips (10.9%), leaf minors (17.6%) and white grabs (12.4%). Little knowledge about pests implies that farmers were unable to establish the growing habits and behaviours of the pests. This probably limited farmers' ability to choose the appropriate method of control and possibly adapt to pesticides as the only solution. This contradicts the IPM approach which relies on knowledge and experience. To minimize losses to pests, farmers should have awareness about the types of pests which attack crops as well as their biology which is not the case in Budondo (Lutap & Atis, 2013)

Almost a half of respondents identified termites (45.6%) as pests. This indicates that some of the farmers in Budondo Sub County knew little about other functions of termites. Most farmers in Budondo knew pests by local names (53.5%), others saw pests' symptoms on their crops while others saw them physically but were not aware of their names. This indicated that pests were common in the study area. Table 3 also portrays that spraying with pesticides (81.8%) is the common method used towards managing pests in Budondo Sub-County. This justifies that crops in Budondo Sub-County were largely affected by pests and farmers try to prevent crop losses to insects and other pests by spraying with pesticides (Seymour, 2004).

As discussed by Lutap and Atis (2013) about organic methods of controlling pests, less than a half of households agreed that farming practices reduce on pest infestation for example picking pests by protected hands (11%), weeding crops to prevent pests (33.2%), rotating crops (41.8%), intercropping (32.4%), spraying with a mixture of any of urine, red pepper, neem or onions (30.3%), using a mixture of pepper and urine (32.9%) while others left them (11.2%) (Table 3). This little awareness could perhaps be due to little exposure to organic pest control measures (Sebastian, Joshi, Gergon, Catudan, & Desamero, 2003).

Measuring organic pest management practices and soil biodiversity conservation

Almost all the household respondents in Budondo Sub-County were aware and had seen soil living organisms (96.2%).

According to Table 6, over nine tens of respondents agreed that they had seen termites (95.6%) and earthworms (91.2%). They agreed that they had seen other soil living organisms (10.9%) including cut worms (43.2%), white grabs (73.2%) as well as beetles (65.6%). This indicated that the farmers in Budondo were aware of soil living organisms (Atina, 2007)

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Table 6: Soil Macro Fauna and their Management in Budondo Sub-County (N=340)

Variables	Yes (%)	No (%)
Are you aware and have seen soil living organisms (soil macro fauna)	327 (96.2)	13 (3.8)
Soil macro fauna		
Termites	325 (95.6)	15 (4)
Earthworms	310 (91.2)	30 (8.8)
Cut worms	147 (43.2)	193 (56.8)
White grabs	249 (73.2)	91 (26.8)
Beetles	223 (65.6)	117 (34)
Other macro fauna	37 (10.9)	303 (89.1)
Indicators of Soil macro fauna presence in the garden		
Anthills	258 (75.9)	82 (21)
Road networks(tunnels) on and through soil	210 (61.8)	130 (38.2)
Decomposing organic matter	141 (41.5)	199 (58.5)
Other indicators	21 (6.2)	319 (93.8)
Are termites and earthworms good to a farmer?	27 (7.9)	313 (92.1)
Bad practices of soil macro fauna (termites and earthworms)		
They eat crops there by reducing yield	295 (86.8)	45 (13.2)
They construct anthills that are laborious to dig	205 (60.3)	135 (39.7)
They destroy houses	216 (63.5)	124 (36.5)
Any other bad practice	15 (4)	325 (95.6)
Management practice of soil macro fauna		
Poison them with chemicals	265 (77.9)	75 (22.1)
Destroy all ant hills in the garden	172 (50.6)	168 (49.4)
Burn vegetation	47 (13.8)	293 (86.2)
Mulch crops	95 (27.9)	245 (72.1)
Apply fertilizers	98 (28.8)	242 (71.2)
Apply animal manure	98 (28.8)	242 (71.2)
Leave them	36 (10.6)	304 (89.4)
Any other practice	5 (1.5)	335 (98.5)

They also agreed that the presence of anthills (75.9%), road networks or tunnels on and through soil (60.3%) and decomposing organic matter were indicators of soil living organisms (Table 6).

However, majority of them reported that soil living organisms were destructive to houses (63.5%), ate crops to reduce yield (86.8%) and constructed anthills which were laborious to dig (60.3%) among other bad practices of macro fauna (4%) (Table 6). The bad practices of macro fauna could not be compared to their long term benefits.

In an attempt to mitigate these bad practices, over a half number of household farmers resorted to poisoning soil macro fauna with chemicals (77.9%) and destroying anthills in the garden (50.6%)

This was in support of Seymour (2014) who stressed that pesticides were used to control organisms that are harmful. However, respondents registered minimal practices of burning vegetation (13.8%), mulching crops (27.9%), fertilizer and animal manure application (28.8%) which would help in conserving the soil living organisms (Table 6).

Table 8 clearly shows that farmers in Budondo Sub County had very little knowledge about benefits of soil macro fauna. This was manifested by more than a half of respondents (53.8%) who claimed that termites and earthworms were not beneficial to a farmer (Table 8). This could be the reason why farmers did not recognize the importance of conserving biodiversity (Tukamushaba et al., 2016).

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Table 8: Organic Pest Management and Soil Macro Fauna Conservation in Budondo Sub-County (N=340)

Variables	Yes (%)	No (%)
Are termites and earthworms beneficial to a farmer	157 (46.2)	183 (53.8)
Benefits of soil macro fauna		
They recycle nutrients into the soil	135 (39.7)	205 (60.3)
They add organic matter into the soil	87 (25.6)	253 (74)
They are the primary decomposer of plant remains	62 (18.2)	278 (81.8)
They modify soil structure	57 (16.8)	283 (83.2)
Any other benefit	3 (0.9)	337 (99.1)
Pesticides and herbicides once sprayed on crops will further kill termites and earthworms?	155 (45.6)	185 (54)
Organic methods of managing pests that help to conserve soil macro fauna		
Good seed bed preparation to expose pests external natural enemies	35 (10.3)	305 (89.7)
Use of pest and disease free seeds	53 (15.6)	287 (84)
Crop rotation	103 (30.3)	237 (69.7)
Inter-planting with crops that repel pests like onions and garlic	40 (11.8)	300 (88.2)
Early planting at onset of rains	21 (6.2)	319 (93.8)
Hand weeding limits the host range of different pests that like weedy areas	59 (17.4)	281 (82.6)
Hand picking of pests	34 (10.0)	306 (90.0)
Pruning infected plant parts controls pests	54 (15.9)	286 (81)
Use ash and urine	61 (17.9)	279 (82,1)
Use neem, pepper and onion mixtures	35 (10.3)	305(89.7)
Any other	9 (2.6)	331 (97.4)
Are you aware of how to make organic pesticide that will help conserve soil macro fauna?	141 (41.5)	199 (58.5)
Organic pesticides that help to conserve soil macro fauna		
A mixture of two or more of ash, neem extract, red pepper extract, urine, onion /garlic extract and marigold	124 (36.5)	216 (63.5)
Cow urine mixed with Lantana camara kill banana weevil, leaf miners, caterpillars in beans and army worms in millet	74 (21.8)	266 (78.2)
Kitchen ash control banana weevil, tomato blight, caterpillars and nematodes	68 (20.0)	272 (80.0)
Apply farm yard manure	50 (17)	290 (85.3)
Mulch crops	35 (10.3)	305 (89.7)
Any other organic pesticides	2 (0.6)	338 (99.4)

Only (39.7%) of respondents supported that soil macro fauna recycle nutrients into the soil whereas less than a third recognized their benefits of adding organic matter into the soil (25.6%), decomposing plant remains (18.2) and modifying soil structure (16.8) among other benefits. This supported the role of soil living organisms (Atina, 2007; Ayuke, 2010).

Less than a half of respondents agreed that Pesticides and herbicides once sprayed on crops would further kill termites and earthworms (45.6%). This indicated that farmers were ignorant about the effects of inorganic pesticides. Less than a quarter of household respondents were supportive of organic methods of pest management. For instance only (10.3%) agreed that good seed bed preparation exposed pests to external enemies, least of them agreed that use of pest and disease free seeds (15.6%), inter-planting with repellant crops like onions and garlic (11.8%), Early planting (6.2%), Hand weeding limiting the host range of pests (17.4%), hand picking of pests (10.0%), pruning infested plant parts (15.9%), use of neem, pepper and onion mixtures (10.3) and use of ash and urine (17.9%) could greatly reduce and control pests from the garden. Only (30.3%) supported crop rotation as a pest management factor. This left a lot of questions why for a vast experience in farming more than a half respondents demonstrated lack of support for at least one organic method of managing pests.

Less than a half of households were aware about a mixture of two or more of ash, neem, red pepper, urine, onions/garlic, and marigold extracts

(36.5%) to make organic pesticide (Table 8). Less than a half could tell that cow urine mixed with lantana camara kills banana weevils, leaf miner, caterpillars and army worms (21.8%) or that kitchen ash could control banana weevil, tomato blight, caterpillars and nematodes (20.0%). This revealed little knowledge about organic pest management control. Due to this, most farmers applied pesticides to increase yield and eliminate pests effectively (Lutap & Atis, 2013).

CONCLUSION

Most of household in Budondo Sub County who practice farming have faced the problem of crop pests. The pests have reportedly attacked farmers' crops and caused significant losses. Soil macro fauna especially termites and earthworms have also been reported as pests by respondents there by disregarding their long term economic benefits of decomposing organic matter and nutrient recycling among others. Due to this pest problem farmers have resorted to use of inorganic pesticides as claimed by respondent (86.5%) because, they are easier to use and effective in eliminating pests.

RECOMMENDATIONS

Based on findings, it is recommended that the Government of Uganda should make and adopt a policy and action plan on organic pest management for sustainable soil biodiversity conservation. Farmers in Budondo should be sensitized about pest management practices in order to increase their knowledge. The sensitization training should explore the advantages and disadvantages of practicing organic pest management practices over inorganic pesticides. Organic pesticides should best alternate inorganic pesticide in the integrated pest management model when a level is determined to cause significant injury to the crop. Farmers should be trained on how to mix plant extracts to form organic pesticides. Adoption to organic pest management practices should be implemented with several approaches and strategies which includes farmers' participation if any success is to be registered.

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