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DETERMINATION OF KNOWLEDGE OF LOCAL FARMERS AND PROCESS OF MAKING AND USING COMPOST MANURE

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Abstract

The use of soil fertility enhancement technologies has become a controversial topic in Sub-Saharan Africa due to their high prices. This has made it difficult for many small-scale farmers to use the equipment. In order to promote low-cost soil fertility enhancement technologies, a study was carried out to determine the utilization of compost manure by smallholder farmers. The study was conducted through individual interviews and observation of 322 smallholder farmers as well as through focus group discussions. The study identified key recommendations for the utilization of compost manure. A knowledge test and a checklist were then developed to evaluate the farmer's knowledge of the technology. The study revealed that the most crucial factor that affected the uptake of compost manure was knowledge. This level of knowledge was required to trigger widespread use of the technology. The study found that the amount of compost that farmers produced was not enough to meet their annual needs. However, they still regarded the technology as beneficial.

Keywords: compost manure, technology adoption, farmers, soil fertility

Introduction

Soil fertility is considered one of the most critical factors in the production of food in the country. Many traditional techniques such as shifting cultivation and natural fallowing have been used to improve soil fertility (Mafongoya, Bationo, Kihara, and Waswa, 2006). Land degradation and its effects on food production will threaten the livelihoods of many households (Bindraban, Velde, Ye, Berg, Materechera, Kiba, Tamene, Ragnarsdo, Jongschaap, Hoogmoed, Hoogmoed, Beek, and Lynden, 2012).

With the increasing population, the need to increase food production to feed the world's growing population is expected to reach a level of 70% by 2050. Despite the benefits of chemical fertilizer, many farmers still resist its use. Among the factors that deter many farmers from using chemical fertilizer is the high prices (Ajayi, 2007). This is one of the most feasible solutions to increase food production through the use of existing land (Nkonya, Koo and Mavenya, 2012). This method can improve soil fertility and minimize the effects of land degradation on production (Mafongoya et al., 2006). In response to the need for more efficient farming techniques, various governments and organizations in Sub-Saharan Africa have launched programs and projects to promote these technologies. Key among the technologies are nitrogen fixing trees and shrubs, conservation farming, green manure and dual purpose legumes, and, organic manure, both animal and compost (Ajayi, 2007).

According to Mafongoya et al., (2006), there are various options for improving soil fertility. However, despite their potential, the adoption of these technologies is still lagging behind scientific advances (Tey, Li, Bruwer, Abdullah, Cummins, Radam, Ismail, and Darham, 2014). The success of any development program depends on the organization's involvement and the local knowledge that the project aims to promote. This aspect is also related to the role of local communities in the development of farming technologies.

In Malawi, the loss of soil fertility has been one of the factors that has affected the country's food production. This issue has raised concerns about the availability of food for the households (Kerry, 2005). In response, the government and its partners have been promoting various soil fertility improvement activities such as the use of compost and conservation agriculture. The loss of soil fertility has been widely attributed to the improper use of fertilizers and other agricultural products

(Mataya, Tembo, Kasulo, and Singini, 2014). In response, various organizations and the government have been implementing various soil fertility improvement projects.

Despite the presence of various individuals and organizations in the area, the use of compost manure has been limited. This practice could lead to the soil's degradation and failure to provide adequate food to the community. Good soil management techniques can help improve the productivity of the soil and its organic matter (Nakhumwa, 2004). This can be done through the establishment and preservation of soil organic matter. The purpose of this study was to determine the knowledge of local farmers about the process of making and using compost manure. It also analyzed the factors that influence the adoption of this practice.

Methodology

The study focused on the utilization of compost manure in two districts in Malawi. Key recommendations were identified for the effective use of the material. These included: importance of compost manure; composting methods; dimensions for each method; composting materials; composting process; and, compost application rates. An interview was conducted to assess the knowledge of the smallholder farmers from Bolero, Mhuju, Rivirivi and Mpilisi Extension Planning Areas (EPA) about the use of compost. A checklist was then created to measure the extent to which they followed the recommendations. The study was conducted using a random sample of households. A pair of models (Logistic and Multiple Regression model) were then used to investigate the factors that influenced the use of compost manure.

Results and Discussion

Farmer's knowledge on compost manure

Table 1: Farmer scores on knowledge of compost manure recommendation (n=322)

Farmer score (%)	No. female respondents (n=207)	%	No. of male respondents (n=115)	%	p=value
Below 30	80	40.8	26	25.0	.0540*
31-50	98	50.0	64	61.5	.1787
51-60	14	7.2	10	9.6	.6068
Above 60	4	2.0	2	3.9	.4912

Mean knowledge score 35.3%, *5% significance level

Knowledge about compost manure was assessed through an oral test. The questions asked included the following: the importance of compost manure, the various methods of composting, and the application of compost. About 90% of the farmers scored less that 50% (Table 1) with a mean score of 35.3%. This was surprisingly low as compost manure is an old technology. However, a possible explanation to this low knowledge is the low extension worker to farmer ratio which was 1:2800. The results revealed that most farmers did not know how to use compost. There was no significant difference between females and males on knowledge scores above thirty percent ($p \leq 0.05$). Although the knowledge gap between males and females was not significant, the number of females who scored under thirty percent was significantly higher than those of males. This is possibly because women are less likely to attend all trainings given by extension workers given other multiple family demands on their time. Only 48 percent of the 150 respondents used compost manure. Compost heaps and pits were assessed based on recommended specifications. Most of them preferred to use inorganic fertilizers. In addition to traditional methods, four other factors were also considered when it came to preparing compost in Malawi. These included chimato (mud insulated), pit, changu, and box. About half of the respondents said they usually used chimato (mud insulated) method while the other half preferred pit method. About 46% of the farmers that

made compost manure reported that they chose pit method because once a pit was dug, they used it several times. Those who made compost manure had a limited supply of nutrients and were unable to provide adequate cover for their land.

Farmers responses for not preparing compost manure

Table 2: Farmers' responses for not preparing enough compost manure (n=322)

Responses for not preparing compost manure	Female (n=207)	%	Male (n=115)	%	p-value
Inadequate labour	128	91.4	40	62.5	.0004***
Inadequate water	52	37.1	22	34.4	.7924
Lack of interest	18	12.9	24	37.5	.0044***
Lack of training	18	12.9	0	0.0	.0333**
Uses other soil fertility technologies	10	7.1	6	9.3	.7005
Fear of worm infestation	2	1.2	0	0.0	.5338

*** Significant at 1% level, ** significant at 5% level.

In May, farmers started composting. The materials they use for their organic farming practice became scarce as they had to walk long distances to find them. More females than males complained that they did not have enough labour ($p \leq 0.01$). This could be the result of the females' busy households. Most of the men surveyed said that they did not have the necessary resources to make compost manure. A significantly higher percentage of men than women indicated that they lacked interest in the compost manure technology ($p \leq 0.01$). The other men indicated that they did not want to learn how to make the fertilizer. Some of them cited the cost as a deterrent, while others said that it would have long-term benefits. Despite this, many of them still decided to implement the technology. Some said they did not want to make compost because they used other organic techniques such as incorporating crop residue into their soils.

Table 3. Factors that influenced compost manure adoption (n=322)

Variable	B	Standard Error	Significance
Household size	-0.238	0.122	0.052*
Growing groundnuts	-1.154	0.536	0.031**
Growing vegetables and pulses	-1.649	0.589	0.005***
Farmer training	1.470	0.714	0.039**
Farmer knowledge	1.203	0.372	0.001***
Constant	-0.695	1.1001	0.487
-2log likelihood	131.291		
Nagelkerke R square	0.332		

Factors that influenced acceptance of compost manure technology

The study focused on the various social and demographic factors that affect the acceptance of compost manure. It was carried out to identify the various factors that determine the level of acceptance of compost. The acceptance of compost was considered as a dependent variable that was influenced by the independent factors. The factors that affected the adoption of compost were identified as farmer knowledge, household size, and training. According to the farmers, they did not apply compost to groundnuts since they prefer to use organic fertilizer. The nitrogen that's found in the soil is then used by the plants to make the soil look good. The number of household members increases when one uses compost. This seems illogical since the expectation is that more people would make compost. The number of households that compost decreased after the number of households increased. It could be that the middle-age parents (30-49 years) parents with school-aged children were not able to make compost due to their busy schedules. An increase in the number of farmers who are trained on how to make compost is expected to boost the adoption of the technology in the area. Knowledge about making and using compost manure was associated

with compost manure adoption (p=0.001). This suggests that the increasing number of extension services in the area will encourage more farmers to adopt the technology.

Table 4: Perceptions of Farmers on compost manure technology (n=322)

Perception	**Number of respondents**		
	Female (n=207)	**Male (n=115)**	**p=value**
Helpful	76.5	75.0	.9455
Not helpful	23.5	25.0	.8378

Compost manure technology perceptions Farmers

An analysis of the potential acceptance of compost manure should be carried out if the concerns of the farmer are fully understood. In a study conducted in 1997, male and female farmers were the same when it came to assessing the potential of the technology. According to the participants, the use of compost manure increased their soil productivity. However, they noted that the application of organic fertilizers was the most beneficial method for them. Understanding the concerns of the farmers is a prerequisite for developing effective technology promotion. In addition, they tend to believe that compost manure is not as effective as organic fertilizers. In Bolero, the dominant perception about compost manure is that it is too labor-intensive and is not suitable for the poor farmers. This makes it hard for them to adopt the technology.

Farmers ranking of soil fertility improvement technologies

During a brainstorming session, a group of farmers discussed the various technologies that can improve soil fertility. The participants were then ranked according to their importance. Among the technologies discussed were organic fertilizers and residue incorporation. According to the farmers, this method is the best for immediate benefits. The participants ranked conservation agriculture as the fourth most important technology. However, due to the lack of livestock, manure was ranked fifth.

Table 5: Farmer suggestions from focus group discussions (n=322)

PROBLEM	SUGGESTED SOLUTION	FREQ.	%
Lack of labour	1. Form village committees to be reminding the community on critical time of making compost manure.	37	83.0
	2. Village heads and committees to work through village clans on making compost manure.	34	75.0
	3. Villages to form plan of action and village headmen to remind the community on the time for making compost manure during village meetings.	30	61.0
Inadequate water	1. Government to provide boreholes and piped water.	36	86.0
	2. Start making compost manure during the peak of the rainy season before moisture runs out.	31	67.0
	3. Use recycled water from domestic use.	19	31.0
Lack of interest	1. Mount demonstrations on use of compost manure and inorganic fertilizers.	38	86.0
	2. Organize visits to sites where the technology has been successful.	31	67.0
Insufficient livestock manure	1. Farmers to incorporate crop residues soon after harvesting for complete decomposition.	31	72.0
	2. Avoid burning of crop residues during land preparation.	26	58.0
	3. Use ashes and rich soils from anthills	19	39.0
	4. 4. Government to provide livestock to clans.	8	3.0

Opportunities for improvement of compost manure technology

After coming up with the preliminary results of the survey, a follow-up focus group was organized to discuss the issues that were identified by the respondents. Some of the main challenges they faced were inadequate labor and water and livestock manure. The group then presented their solutions on flipcharts. After carefully analyzing the suggestions, the most promising ones were then voted on by the participants. Through the group discussions, the participants were able to come up with their own solutions to address the issues they faced. They also noted that the traditional leaders' positions could benefit the development of agricultural technologies. Other

factors such as the availability of water and farming techniques were also taken into account during the discussions. One of the suggestions made was the use of piped water to address the water shortage during dry periods.

Conclusions and Recommendations

The most critical factor in the adoption of compost manure was knowledge. This factor was low among farmers. Knowledge is a pre-requisite for any technology adoption. This is because knowledge is needed to raise the level of adoption gradually. Extension services play a vital role in promoting the use of compost manure technology. Extension services should also intensify their activities to improve the knowledge and perception of farmers about the technology. These should be done through groups for social support, encouragement and experience sharing. Many farmers who were into composting often found that the amount they made fell short of their annual needs. The main reason for this was that the materials needed for making compost were not available during the start of the rainy season. Through the group's discussion, it was also revealed that society's attachment to traditional leaders could help boost the adoption of modern agricultural technologies. Being associated with traditional leaders can help boost the adoption of technologies such as compost manure. It can also help avoid the staff shortages that crop up due to the lack of skilled workers.

In addition, it was also suggested that indigenous knowledge be incorporated into the development of compost manure. This can help producers make the most of the nutrients from the plant. Raw materials used in the production of compost should be carefully selected to avoid attracting rodents and destroying crops. The promotion of compost manure use should also focus on increasing the awareness of farmers about its long-term advantages. This could include improving soil fertility, reducing greenhouse gas emissions, and increasing water holding capacity. Various techniques

that can help minimize labor costs should also be explored in order to make the process more cost-efficient. This can help reduce the high labor demand that often accompanies the production of compost. Promoters of the use of group labor- chiwovwirano should also be involved in the development and implementation of compost manure utilization techniques.

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