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THE SMALLHOLDER FARMERS PERCEPTION TOWARDS CONSERVATION AGRICULTURE

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ABSTRACT

Conservation Agriculture (CA) revolves around three principles; no-till (or minimal soil disturbance), soil cover, and crop rotation. This set of practices has proved to have environmental and agronomic benefits. In smallholder farms in sub-Saharan Africa, CA is increasingly being promoted as one of the strategies to improve soil health, conserve soil moisture, reduce food production cost and hence increase food security, alleviate poverty, conserve biodiversity, and increase resilience to climate change impacts like drought. This study sought to understand how smallholder farmers in Tanzania perceive conservation agriculture. The target farmers were those who had been exposed to conservation agriculture technology by the Sustainable Intensification of Maize-Legume Systems for Food Security in Eastern and Southern Africa (SIMLESA) project which was implemented by CIMMYT. Questionnaires were administered to 94 households in three villages of Morogoro Rural District, Tanzania, in March 2019. The data collected was analyzed for qualitative and quantitative trends using SPSS. All the respondent farmers were aware of conservation agriculture. Eighty-three percent (83%) heard about it for the first time from the SIMLESA project. Only 17% of the respondents had not received training about minimum tillage, crop residue retention, herbicides application among other conservation agriculture principles. A total of 81% of the farmers agreed that conservation agriculture improves soil structure and protects soil from erosion, nutrient losses, and increased maize and legumes yield. This study concluded that small scale farmers are well aware of and perceive conservation agriculture positively.

Keywords: Conservation agriculture, Awareness, Perception, Adoption, Farmers.

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INTRODUCTION

Agriculture is the backbone of the economy of many developing countries. Typically, it is the largest source of employment; often two-thirds or more of the population of developing countries are dependent on farming for their livelihood (FAO, 2008). In Sub-Saharan Africa, the agricultural sector has a pivotal role in employment, employing 65 percent of the total workforce (OECD & FAO, 2016). Smallholder farms constitute approximately 80% of all farms in sub-Saharan Africa and employ about 175 million people directly (AGRA, 2014)

In Tanzania, according to a report from the state, agriculture is the leading sector of the economy. It accounts for about half of the national income, three-quarters of merchandise exports and employs 80 percent of the country's population especially those in rural and peri-urban areas (United Republic of Tanzania, 2014). The report further states that it contributes 24.7% of Gross Domestic Production (GDP) and provides 95% of food requirements in the country. Recent data shows that in the year 2014, agriculture contributed 31.5% of GDP in Tanzania (OECD & FAO, 2016).

The Malabo Declaration of Africa Union (2014), on accelerated agricultural growth, strives to eradicate hunger in Africa by 2025. Among other objectives, it targets a doubling of agricultural productivity within the context of resilient agricultural systems (Africa Union, 2014). At farmer level, intensive tillage-based farming practices result in degradation of agricultural soils, and the consequent loss in soil health and their productive capacity (Huggins & Reganold, 2008; Montgomery, 2012). Soil degradation has caused agricultural yields in many parts of Africa to fall by up to 50% (E. L. D. Initiative & UNEP, 2015). One of the main causes of soil degradation identified in Africa by the ELD Initiative and UNEP is inappropriate methods of soil

preparation and tillage. This is characterized by intensive soil preparation using hand hoe or plough combined with removal or burning of crop residues (Rockström et al., 2009). Soils and landscapes are part of living biological and ecosystem resource base and should be managed to yield the desired high agricultural production.

Conservation agricultural tillage systems is a potent solution to soil degradation challenges. In the specific context of Africa with resource-poor farmers, conservation agriculture systems are relevant for addressing the challenges of climate change, high energy costs, environmental degradation, and labour shortages (A. Kassam, Friedrich, Derpsch, & Kienzle, 2015). As explained by (Amir Kassam, Friedrich, Shaxson, & Pretty, 2009), Conservation Agriculture has three components; a) maintaining year-round organic matter cover over the soil; b) minimizing soil disturbance by tillage; c) diversifying crop rotations, sequences, and associations.

Conservation agriculture is gradually gaining popularity among farmers globally. In Sub Saharan Africa conservation agriculture is much needed to increase resilience to climate change challenges, however, its adoption is still low, (A. Kassam et al., 2015; Stevenson, Serraj, & Cassman, 2014; Vanlauwe et al., 2014). In Tanzania, Conservation Agriculture is available and practiced in different forms, the most common ones being: terracing, pit and trench farming, ox-drawn ripping and micro-catchment water harvesting systems, (Kahimba, Mutabazi, Tumbo, Masuki, & Mbungu, 2014; Lugandu, Dulla, Ngotio, & Mkomwa, 2012; Shetto & Owenya, 2007). However, adoption levels are still very low. This could be hindered by how farmers perceive conservation agriculture. With this background, this research sought to find out the perceptions of farmers towards conservation agriculture practices in Tanzania.

METHODS:

The study administered household questionnaires to farmers that participated in the Sustainable Intensification of Maize-Legume Systems for Food Security in Eastern and Southern Africa (SIMLESA), a conservation agriculture awareness project by International Maize and Wheat Improvement Center (CIMMYT). The details of the project are found on this link <https://simlesa.cimmyt.org/>. A sample of 94 farmers from 12 different villages was taken from Mikese, Tomondo, and Bwawani wards in Morogoro Rural District, Tanzania. The respondents were sampled from farmer groups at the village level, taking every lead farmer and neighbors. Data was collected from the farmers through a questionnaire that had both closed and open-ended questions. The responses were recorded in the questionnaire by the researcher. All the data collected was organized in a spreadsheet and analyzed using SPSS. Descriptive and inferential statistics were used to interpret the data.

RESULTS AND DISCUSSION:

Description of Respondent:

The age of respondents varied from 19 years to 78 years old with 10 youth respondents who were 35 years of age and below. Gender representation was fairly balanced with 54% of female respondents. Gwata ward had the greatest number of female respondents while Mikese had the greatest number of male respondents.

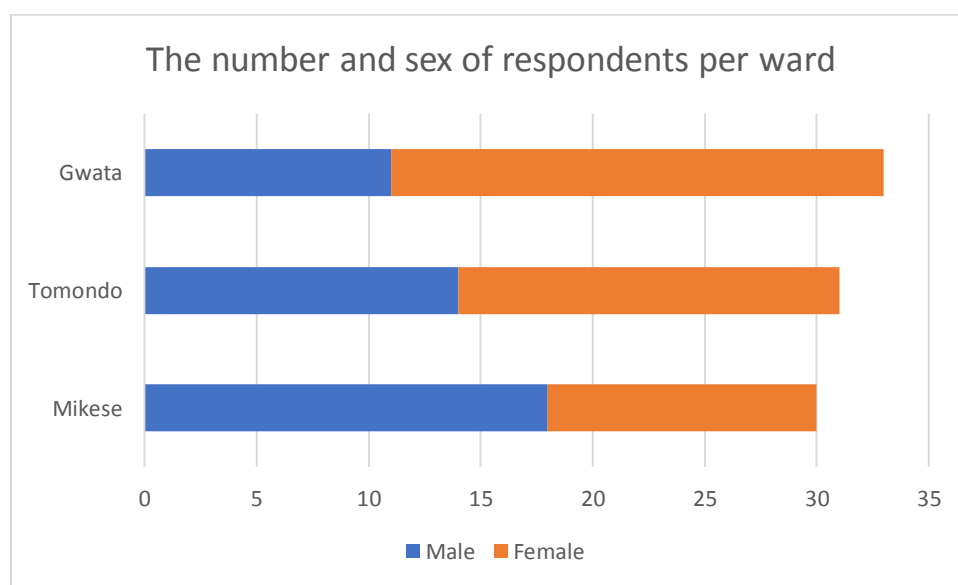


Figure 1. The number of respondents per Ward by gender

The majority, 85%, of the farming community interviewed had a primary level of formal education. The highest level of education among the interviewed farmers was college education constituting 1% of the sample. Only 7.5% of the farmers that had secondary education, while 6.5% had not received any formal education. Comparing to the Tanzania adult literacy rate of 77.89%, the education level of farmers in the three study wards is acceptable, (“Tanzania—Literacy rate,” 2015).

Awareness and training of conservation agriculture:

All the respondent farmers were aware of the various aspects of Conservation Agriculture. Eighty-three percent (83%) heard about CA for the first time from the SIMLESA project. In Morogoro rural district, the project was implemented by a nationwide farmers-based organization called MVIWATA, from the year 2015. A majority of the farmers in the registered groups participating in the project availed themselves for training on minimum tillage, crop residue retention and crop cover, crop rotation and herbicides application among other conservation agriculture principles. Discussions with MVIWATA disclosed that although SIMLESA was officially closed in 2018, training will continue in the villages by the promoter farmers using demonstration sites.

Farmers perceptions about the benefits of conservation agriculture:

The farmers perceive that conservation agriculture has benefits. The study asked the respondent what they think about benefits that accrue from the various practices constituting conservation agriculture, including viz; reduction of soil disturbance, improving soil structure, increasing soil fertility, protecting soil from erosion and nutrients loss, reduction of labor, enhancing water holding capacity and reduction of surface evaporation, protection of soil from extreme temperatures, increase of crop yield, reduction of greenhouse gases emission into the atmosphere, breaking of pests and disease cycles on the farm, feeding soil organisms, reduction of weed growth. The overall response had less than 1% negating the fact that conservation Agriculture is beneficial to the farmer and to the environment. About 78% of the respondents affirmed that the benefits are tangible in conservation agriculture systems. 21% of the interviewed farmers did not know about the benefits, therefore they did not have an opinion about it (Figure 2).

A total of 81% of the farmers agreed that conservation agriculture improves soil structure and protects soil from erosion, nutrient losses, and increases maize and legumes yield (Table 1). In a review by (Knowler & Bradshaw, 2007), farmer awareness or perception of soil problems was frequently found to positively correlate with the adoption of soil conservation practices like no-till. However, in Tanzania, according to this study, the awareness level is relatively high despite the fact that adoption rates are low.

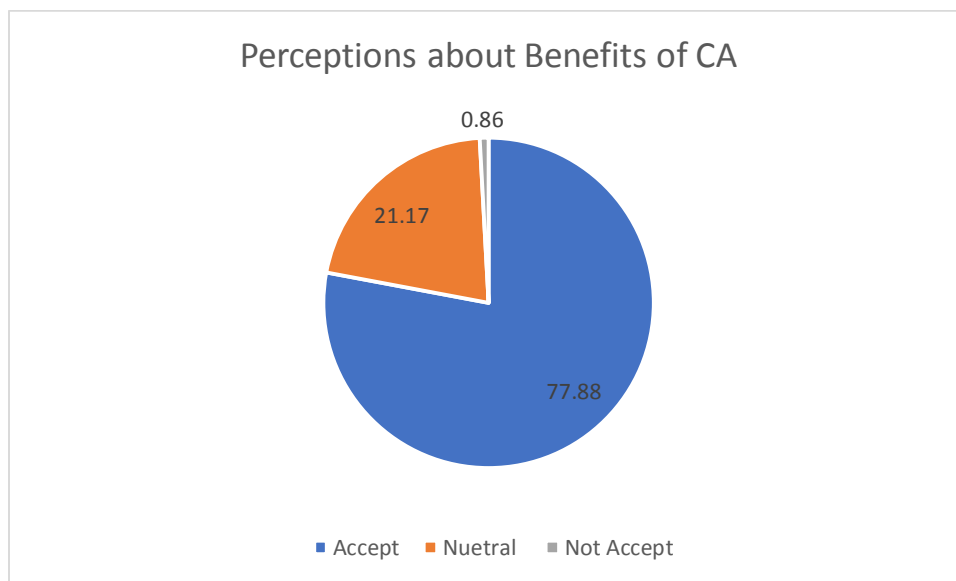


Figure 2. Perceptions about the benefits of CA

Assessing the perception concerning each benefit, the farmers had varying levels of acceptance from their experience (Table 1). Crop rotation which is an important principle of conservation agriculture is believed that it helps to break the life cycles of crop pests and diseases. A total of 60% of the farmers agreed with that. Considering that it takes a whole cropping season before a farmer could rotate the crops, its adoption is slow. The other challenge which would hinder the rapid adoption of crop rotation

is farm size. Many small-scale farmers in East Africa hold less than one acre and therefore do not have much flexibility in terms of what to grow since priority is given to staple food growing, mainly maize (*Zea Mays*).

Table 1. Opinion about the benefits of various Conservation Agriculture (CA) practices

Benefits of CA	Accept (%)	Neutral (%)	Not Accept (%)
CA increases crop yield	83.9	16.1	0
CA improves soil structure and protects the soil surface	81.7	18.3	0
CA reduces labour	79	19	1
Crop residue enhances moisture retention capacity	81.7	17.2	1.1
Crop residue protects soil from erosion and feeds soil organisms	82.8	17.2	0
Mulches protect soil and reduce surface evaporation	80.6	19.4	0
No-till contributes to reducing greenhouse gases emission	66.7	32.3	1.1
Direct seed planting increases yield and reduces soil disturbance	78.3	21.7	0
Crop rotation breaks disease cycle	60.2	34.4	5.4
Cover crop reduces weed growth	83.9	16.1	0

CONCLUSIONS AND RECOMMENDATIONS:

This study concluded that farmers are well aware of conservation agriculture and its benefits. Their perceptions are largely positive. It is expected therefore that the adoption of conservation agriculture will grow in Tanzania. However, it is possible that knowledge and perception are not the only reasons for farmers to adopt agricultural innovations. Therefore, it is recommended that the other underlying factors be considered and addressed to enhance adoption of conservation agriculture.

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