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Growth and productivity of clover in response to the preceding crops and organic matter applications in the highlands of Awi Zone of Ethiopia

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Introduction

Declining of soil fertility and food insecurity are the recurrent problems in Sub-Saharan Africa. Continuous cultivation without or limited application of organic inputs into the soil and conventional rotation system management is the consequence of declining the soil fertility and productivity Zingore (2011). Besides, limited incorporation of organic matter inputs into the soil during the past 50 years has led to deteriorating soil structure, health and ultimately the yield of much forage and crop yield Carl *et al.* (2007).

Hence, the article is about the impact of different preceding crop and organic amendments on the biomass yield of clover under Sub -Saharan climatic and soil conditions. We aimed at this issue because clover could contribute to solving the key challenges of agriculture in many agro-ecological zones of Sub-Saharan Africa. Provide high quality and quantity feed, restore soil fertility due to the improvement in C sequestration, deep root penetration, high root biomass and their ability to fix nitrogen biologically Ruser *et al.* (2008). In low input systems play a critical role in improving crop and livestock productivity on a more sustainable

basis? However, due to poor agronomic management practices and improper soil management system, the biomass yield of clover can vary considerably from region to region. The situation is very much worsening in the study district. Farmers of the locality have little experience of growing of clover with the use of organic inputs. Rather use voluntarily growing clover in their pasture land and between farmlands as a source of feed and green manure. In view of these, the present study were initiated to find out the effect of preceding crop and organic matter applications on growth parameter and biomass yield of clover under Sub-Saharan climatic and soil conditions.

Material and Methods

The study was aimed to investigate the effect of different levels of organic matter applications and preceding crop effect on biomass yield of clover. Two levels of proceeding crop and four levels of organic matter applications were factorially combined. The design of the experiment was a completely randomized block design (RCBD) with four replications. The organic treatments were: V1 (control without any additions); V2 (FYM at 5 t ha^{-1}); V3 (FSB at 2.5 t ha^{-1}); V4 (FSB at 2.5 t ha^{-1} combined with FYM at 5 t ha^{-1}). Manure was uniformly surface broadcasted and then incorporated within 20 cm soil depth two weeks before planting. The preceding crops were potato and wheat. The size of the plot was 3 * 3 m with a net plot size of 2.8 *2.8 m. The distance between plots and replications was 50 and 100cm, respectively. The seed of the most adaptive Ethiopian Trifolium variety, Trifolium decorum was used with drill planting and row spacing of 20cm.

Results and Discussion

The overall combined experimental result indicated that the main effect of preceding crops (factor A) and the interaction (AXB) effects of preceding crop and

organic matter (B) application had not significant effect on biomass yield of clover (Table1). However, the main effect of applications of organic matter applications (factor B) has a significant effect on the biomass yield of clover (Table 1).

The highest above ground dry biomass of clover (5.6 t ha^{-1}) was recorded by the combined application of FYM at 5 t ha^{-1} and FSB at 2.5 t ha^{-1} followed by the organic treatment FYM at 5 t ha^{-1} · The lowest total shoot biomass of 3.06 t ha^{-1} was recorded on the untreated check. FSB at 2.5 t ha^{-1} gave a slightly higher dry biomass of shoot and root dry biomass of 3.46 compared to the control. The increased in biomass is due to the raise in nutrient levels at higher farmyard application rates. The result is in agreement with previous studies which affirmed application of combinations of manures improves the biomass of several crops. Furthermore, **Farhad** *et al.* (2014) demonstrated that combinations of manure that holds 3 t ha^{-1} of cow manure and 2 t ha^{-1} of chicken manure significantly increased the dry weight of cowpea. According, Singh *et al.* (2010) identified that fresh and dry biomass yield of menthol mint increased by 23.4 % through the use of green manure. Similarly, Mpairwe *et al.* (2002) noted that application of manure significantly yielded higher fodder dry matter (9.3 t ha^{-1}) than recorded on unfertilized control (7.1 t ha^{-1}).

Conclusion and outlook

The overall experimental results indicate that the highest total dry biomass of clover (5.6 t ha^{-1}) was recorded with combination of FYM at 5 t ha^{-1} & with FSB at 2.5 t ha^{-1}. The unfertilized control gave the lowest mean dry biomass (3.06 t ha^{-1}) of clover compared to all other treatments. Thus, a combination of FYM at 5 t ha^{-1} & FSB at 2.5 t ha^{-1} could be recommended for better dry biomass yield of clover.

The finding also bridges the gap of chronic livestock feed shortage and green manure under sub-saharan environmental conditions.

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