Amhara National Regional State Bureau of Agriculture

Sustainable Land Management Program

Adoption and Success Story on Conservation Agriculture as in the Case of Bure Zuria Wereda Chenetali Micro-watershed

June, 2020

Bahir Dar, Ethiopia

Introduction

Enhancing food security while contributing to mitigate climate change and preserving the natural resource base and vital ecosystem services requires the transition to agricultural production systems that are more productive, use inputs more efficiently, have less variability and greater stability in their outputs, and are more resilient to risks, shocks and long-term climate variability. More productive and more resilient agriculture requires a major shift in the way land, water, soil nutrients and genetic resources are managed to ensure that these resources are used more efficiently.

Conservation agriculture (CA) can be considered a form of climate smart agriculture. Conservation agriculture is based on the principles of minimum soil disturbance, permanent soil cover, and diversification through crop rotation or associations (Thierfelder, et *al.* 2018). Conservation agriculture has been proposed as an approach to increase yield, carbon sequestration, to enhance biodiversity, and to save on labor and costs (FAO, 2018).

Mulching is a key factor in the success of CA. Mulching has to be combined with adequate nitrogen application. Nitrogen application is important in order to reduce nitrogen immobilization in the soil as a result of organic inputs, and to ensure sufficient mulch production every year.

The major challenge for the development of CA in Ethiopia is the retention of crop residues as mulch, as livestock graze freely in the dry season. Options for increasing the of crop residues as mulch include reducing the use of crop residues livestock fodder by developing alternative fodder resources and reducing the number of animals. For successful adoption of CA, it is not only necessary to address the three core principles of CA, but it is also important to include complementary practices and enabling factors (Thierfelder, et *al.* 2018). CA can be best promoted by combing technological, socio-economic and institutional approaches.

This paper is organized to show the adoption and success story of CA in climate smart agriculture (CSA) pilot micro watersheds implemented in the last few years.

Adoption and Success story of CA, Bure Zuria Wereda, Chenetalli Micro-watershed

Chenetalli is one of the pilot climate smart agriculture (CSA) micro-watershed under Yesir watershed at Bure Zuria Wereda where CSA interventions have been implemented from 2016 since then. Conservation agriculture can be considered a form of climate smart agriculture and it has been proposed as an approach to increase sustainable yield, carbon sequestration, to enhance biodiversity, and to save labor and costs.

Mr. Fentahun Birhane is a model CSA farmer who is living in Bure Zuria wereda of Jib Gedel kebele. He possess 0.75 hectare of land with CSA interventions in Chenetalli micro-watershed. He has implemented CA interventions for last 4 years.

Mr. Fentahun noted his previous agricultural practices as "My farm land was severely degraded due to repeated tillage, free grazing, and poor soil and water conservation practices before the introduction of SLM Project." He explained as "there was complete removal of crop residue for my livestock and for other local uses like fuel and construction." As he stated, farm lands after harvest were the major livestock grazing options during dry season or off season which was causing bare, disturbed and degraded soils. Mr. Fentahun also noted that he was plowing his land more than four times. He explained that soil erosion by wind during dry season and by flood during rainy season caused degraded and depleted soils. As he stated yield before project intervention was very low.

After a year of biophysical soil and water conservation, and CA practices intervened on his farm, Mr. Fentahun noted an important difference in the health and fertility of his soil. He explained, "I retained crop residue on the farm land, tillage frequency was minimized, potato intercropped with beans; cereals rotated with pulses and vegetables; the land became more fertile and had better organic matter and the soil maintained more moisture."

Mr. Fentahun went on to adopt potato and bean, potato and wheat, barley and lupine relay-intercropping, crop rotation, minimum tillage practices and crop residue retention across the entirety of his farm, which has not only helped to increase his yields, but has enhanced his nutrition and income security. Mr.Fentahun was growing only potato or wheat or barley per a season, but with intercropping, his farm has become more diverse." He also now grows lupine as cover crop.

Figure 1. Mr. Fentahun Birhane (CSA Farmer in Chenetali Micro-watershed, Bure Zuria Wereda)

He explained that improved forage development from pasture lands, back yards, farm boundaries like tree lucern and densho grass and implementation of bylaws were important options for increasing crop residue use. Generally, Mr. Fentahun noted a significant yield increase after the intervention of conservation agriculture.

Table 1. Inter cropping practiced on Mr. Fentahun plot of land

No.	Relay inter cropping	Component crops yield (qt/ha)		Aggregated yield (qt/ha)
1	Potato with faba bean	Potato	Faba bean	152
		140	12	
1	Potato with wheat	Potato	Wheat	152
		140	12	
2	Wheat with potato	Wheat	Potato	112
		32	80	
3	Barley and lupine	Barley	Lupine	44
		32	12	

Fentahun described his previous yield before project intervention as, 60 quintal per hectare for potato, 16 quintal per hectare for barley, 12 quintal per hectare for wheat and 8 quintal per hectare for faba bean. However, it is important to note that the current yield increase is not only due conservation agriculture intervention but it is also due to an integrated package implementation such biophysical soil and water conservation, integrated soil fertility management like use of organic and chemical fertilizers, and improved crop variety use.

Table 2. Crop rotation practiced on Mr.Fentahun plot of land

No.	First year/season	Second year/season	Third year/season	Fourth year/season
1.	Tef	faba bean	Barley	Tef
2.	faba bean	Barley	Tef	faba bean
3.	Wheat	faba bean	Potato	Wheat
4.	Barley	Tef	faba bean	Barley

Figure 2. Wheat crop residue management (a) first season cropping

Figure 3. Potato with minimum tillage followed by faba bean relay inter cropping, and lupine as cover crop (b) second season cropping on the same plot of land

Compared to using conventional farming methods, the current approach enabled Mr. Fentahun to save money and labor, improve soil productivity, conserve soil and soil moisture and improve soil structure, and thus rooting zone. He says “I also use less chemical fertilizer because of retaining crop residue.”

However, according to Mr. Fentahun, the implementation of CA practices has not been without its challenges, particularly with regards to the local livestock of neighboring farmers that are free to roam across his fields during the dry season and consume his crop residue.