

Impact of vetch cover crop on runoff, soil loss, soil chemical properties and yield of chickpea in North Gondar, Ethiopia

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Cover crops improve the sustainability and quality of both natural system and agro ecosystem. In Gumara-Maksegnit watershed which is located in Lake Tana basin, farmers usually use fallow during the rainy season for the preceding chickpea production system. The fallowing period can lead to soil erosion and nutrient losses.

A field experiment was conducted during growing seasons 2014 and 2015 to evaluate the effect of cover crops on runoff, soil loss, soil chemical properties and yield of chickpea in North Gondar, Ethiopia. The plot experiment contained four treatments arranged in Randomized Complete Block Design with three replications: 1) Control plot (Farmers' practice: fallowing- without cover crop), 2) Chickpea planted with Di-ammonium phosphate (DAP) fertilizer with 46 k ha⁻¹ P₂O₅ and 23 k ha⁻¹ nitrogen after harvesting vetch cover crop, 3) Chick pea planted with vetch cover crop incorporated with the soil as green manure without fertilizer, 4) Chick pea planted with vetch cover crop and incorporated with the soil as green manure and with 23 k ha⁻¹ P₂O₅ and 12.5 k ha⁻¹ nitrogen. Each plot with an area of 36 m² was equipped with a runoff monitoring system. Vetch (*Vicia sativa* L.) was planted as cover crop at the onset of the rain in June and used as green manure.

The results of the experiment showed statistically significant ($P < 0.05$) differences on the number of pods per plant, above ground biomass and grain yield of chick pea. However, there was no statistically significant difference ($P > 0.05$) on average plant height, average number of branches and hundred seed weight. Similarly, the results indicated that cover crop has a clear impact on runoff volume and sediment loss. Plots with vetch cover crop reduce the average runoff by 65% and the average soil loss decreased from 15.7 in the bare land plot to 8.6 t ha⁻¹ with plots covered by vetch. In general, this result reveals that the cover crops, especially vetch, can be used to improve chickpea grain yield in addition to reduce soil erosion in the watershed.