(Form No. 14)

ABSTRACT OF DOCTORAL THESIS

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Title: Improved agronomic practices increase productivity of teff in a water erosion-prone environment
（水食が起こりやすい環境における改良栽培法によるテフの生産性向上）

Teff is an important food-security crop and serves as a source of income for millions of smallholder farmers in Ethiopia. The productivity of teff remained very low (< 1.5 t ha^{-1}) highly constrained by occurrence of lodging, drought, decline in soil fertility and low input application. Moreover, teff-based cultivated lands are highly degraded and vulnerable to water erosion exacerbated by traditional agronomic practices such as repeated tillage, soil compaction, mono-cropping and complete removal of crop residues. The traditional teff cultivation system is thus the major driver of high rates of soil erosion that led to the low crop productivity. Crop yields and farm management practices widely vary across farms in the rain fed teff production system, but little has been understood about this variability. Therefore, implementation of improved agricultural practices in the framework of sustainable land management is inevitable to reverse the adverse effects being caused by the traditional agronomic practices would improve teff productivity in erosion-prone environments in Ethiopia. The objectives of this doctoral research were to assess the characteristics of the Ethiopian teff-cropping system and evaluate the impacts of different tillage, sowing, and soil compaction practices, and their combinations, on soil loss and teff productivity in water erosion-prone environment. Therefore, a farm survey was first carried out followed by a field experiment that was carried out at the Aba-Gerima watershed of northwestern Ethiopia, the effects of two tillage practices (reduced tillage [RT] and conventional tillage [CT]), two planting methods (row planting [RP] and broadcast planting [BP]), and two compaction options (with [+T] and without [–T] trampling) on soil loss and teff yields were examined in a split-split plot arrangement. The survey study revealed that teff production system is a low-yielding, less-profitable, and resource-intensive enterprise. The observed variations in yields among farms indicated that there is a big opportunity to improve teff productivity through improved agronomic practices. The survey revealed that the traditional teff cultivation system is the major cause for the low teff productivity in erosion-prone areas and the need to promote improved agronomic practices. The field study proves that the minimum soil disturbance and increased biomass cover in RT resulted in a significant reduction in soil loss that could be lost with the runoff that in turn helps to conserve soil organic carbon and soil moisture. This improvement in topsoil conditions contributed to the higher teff productivity in RT than in CT. The better resource utilization (water, nutrients and light) in RP leads to a better teff productivity compared with BP. The field study also indicated that teff productivity was not influenced by soil compaction practices. Therefore, improved agronomic practices (reducing the number of tillage, row sowing without soil compaction) can be promoted for increasing teff productivity and profitability if properly integrated with an appropriate weed control and labor-reduction strategies in water erosion sensitive areas in Ethiopia.

"* In addition, some of the figures, etc., have been omitted."