Ph.D. Project Description of Wagayehu Bekele

I. Short CV

1.1. General

Full Name: Wagayehu Bekele
Sex: Male
Date of birth: 13-02-1959
Place of birth: Hararghe, Ethiopia
Nationality: Ethiopian

1.2. Educational background

No.	Certificate/Diploma	Institute	Year
1	Ethiopian Schools Leaving Certeficate	Chercher Comprehensive Secondary School, Asebe-Teferi, Ethiopia	1980
2	B.Sc. in Agricultural Economics	Addis-Abebaa University, Alemaya College of Agriculture, Ethiopia	1984
3	M.Sc. in Agricultural Development Economics	Institut National Agronmique, Paris, France	1989
4	Post-Graduate Diploma, in Integrated Rural Regional Development Planning	Development Study Center, Rehovot, Israel	1994

1.3. Current status: Ph.D. student at Swedish University of Agricultural Sciences, Department of Economics, Uppsala, Sweden.

1.4. Permanent Employment: Lecturer at Alemaya University, Department of Economics, Alemaya, Ethiopia.

II. Ph.D. Project Description

Title: Economics of Soil and Water conservation: An Empirical Study from Eastern Ethiopian Highlands.

Wagayehu Bekele

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1. Background

Soil erosion is a global natural process that has taken place and will always take place. This natural process is accelerated and turnout to be untenable social and economic problem due to human activity that exposes the soil to various agents of erosion. The effect of soil erosion is quite significant and poses a threat to food security and survival of large number of poor people in many poor countries where the problem is most serious. Among the different human activities that accelerate soil erosion process, agriculture is the most important and most soil erosion occurs on cultivated lands. The presence of soil erosion results in on-site and off-site externalities, that is on-site and off-site costs and benefits that are not reflected in market prices. The presences of externalities from soil erosion and other institutional factors in developing countries results in market failure, and hence in inefficient allocation of scarce resources. Under this condition individual farmers lack incentives to practice soil conserving agricultural practices unless appropriate economic policies are introduced to correct the market failure. This necessitates government intervention to ensure efficient and sustainable use of the soil resource in order to improve the well being of the society.

Cognizant of the fact that soil erosion reduces yields and incomes, and poses a threat to household food security in many areas, substantial efforts have been directed towards finding appropriate soil and water conservation measures for low-income farmers. In spite of multiplying conservation efforts in the past few decades, erosion remains wide spread and adoption of conservation practices by farmers remained limited. As a result, the need for socio-economic analysis of erosion control measures became apparent. The practicality of reducing soil erosion and rehabilitating degraded soil depends on the costs relative to the value of output or environmental benefit expected. In this way, socio-economic forces constrain technical solutions. Understanding socio-economic factors, and designing policies that that promotes conservation, will play an important role in promoting soil conservation.

The purpose of this thesis is to analyze the socio-economic aspects of this global phenomenon of soil erosion as it applies to subsistence farmhouse holds in the eastern Ethiopian highlands, Hunde-Lafto area, where soil erosion problem is among the most serious in the world. The dynamic nature of soil erosion problem and effects of soil conservation suggests the need to consider the issue from short-term as well as long–term perspective. The thesis will consist of the following four articles.

2. Articles

2.1. Stochastic dominance analysis of soil and water conservation (Wagayehu Bekele)

The aim of this paper is to analyze whether investment in soil and water conservation results in a higher net return and/or mitigate variability in return to subsistence farm households in the study area. In order for farmers to invest in soil and water conservation (SWC) and retain the practice as an integral part of their farming practices, they need to have incentives in terms of expected return and/or reduced variability in return. Net returns from a traditional crop production system without SWC structure and a practice that involves the construction of soil/stone bund type of physical SWC structure are compared based on stochastic dominance (SD) criteria. Stochastic dominance criteria help to make pare-wise comparison of a set of alternatives based on the cumulative probability distributions of net return. A nonparametric first order SD analysis is undertaken to determine whether investment in SWC unambiguously yields a higher return than without conservation farming practice. Normalized second order SD approach is used to determination whether SWC practice unambiguously reduce yield and income variability to subsistence farmers as compared to practices without conservation.

The results of first order stochastic dominance analysis show that expected net return from crop production with SWC unambiguously dominates the net return without conservation. However the normalized second order stochastic dominance analysis does not support the hypothesis that soil and water conservation strategy unambiguously results in less yield variability than no-conservation strategy.

2.2. Optimal Path of Investment in Soil and Water Conservation (Wagayehu Bekele)

The aim of this study is to determine the optimal intertemporal path for investment in SWC by subsistence farmers in the study area. Soil management is a dynamic process that must be adjusted continuously to changes in soil depth. Effects of soil erosion on crop yield, and consequently on farm household income is dynamic in nature, in the sense that the current year's soil loss will affect not only the current year's yield level but also the yield levels of succeeding years. Similarly the effect of investment in SWC on crop yield and farmers' income is also dynamic in nature because soil conserved today will help to improve crop yield and farm income in the future. This dynamic nature of the effect of soil resource use decision necessitates a dynamic intertemporal analysis.

A dynamic programming model is used in this study to determine the optimal time path for investment in SWC. In the dynamic programming model, soil depth is used as a state variable and the decision variable is the effort put into soil and water conservation. Data from Soil Conservation Research Program (SCRP) database for the Hunde-Lafto research unit is used in the analysis, and the analysis is made using the General Purpose Dynamic Programming (GPDP) software developed by Kennedy (1986). Analysis is made for different price levels and discount rate as apart of sensitivity analysis. Results of the analysis suggest that increase in discount rate creates disincentive for investment in soil and water conservation suggesting that farmers' time preference rate will affect their conservation decision. Increase in

market price of grains is found to provide incentive for investment in SWC while lower prices discourage investment. Further analysis of the results suggest that agricultural practices without SWC yields higher net return in a short-run, while practices with SWC yields a higher net return in the long-run as well as higher overall net return.

2.3. Soil and water conservation decision behavior of farmers (Wagayehu Bekele & Lars Drake)

Analysis of plot-level determinants of soil and water conservation decision by subsistence farmers in the study area is made in this study. It is difficult to generalize about the factors affecting adoption of SWC technologies in different parts of the world or even in different regions of a country because of the differences in agro-ecological and socio-economic settings under which farmers operate. While the principal economic rationality assumption, the utility maximizing objective of individual farmers, might be the same for farmers everywhere, the specific attributes influencing the utility of farmers and adoption decisions are far from uniform. Adoption of soil and water conservation practices depends upon these differences in attributes, many of which are specific to a particular region, village, household, and plot.

A multinomial logit model is used for analysis of survey data from the study area. This model makes it possible to study the determination of the factors influencing soil and water conservation in the context of individually specific data on multiple choices. In the multinomial logit analysis plots are classified according to their status at the time of the survey, and the distribution of plots among groups is explained in terms of the characteristics of the plot and the farm household. Results of the multinomial logit analysis suggest that the adoption of different classes of conservation structure is influenced by different factors and at different levels of significance by the same factor. In general plot area and slop, access to information, and project assistance have shown positive correlation with SWC decision. Family size and land holding per economically active household member are found to influence the decision negatively.

2.4. Farmers' Preference for Development Intervention (In progress) (Wagayehu Bekele)

This study deals with the general context of overall agricultural problems and farmers, preferred intervention to overcome the problems. Most studies dealing with the impact of rural development programs and agricultural technology adoption by farmers in developing countries are often based on ex-post analysis of intervention programs. Farmers are rarely consulted, a priori, about their specific circumstances, priority problems, and their preference for type of intervention. The adoption behavior study comes after the costs are incurred and the technologies have been diffused. Farmer's preferences for the type of intervention rarely appear in the long list of explanatory variables suggested. Such technological interventions often resulted in low level of acceptance by the target group and resulted in lower level of success for development programs. Prior identification of farmers' priority problems and predisposition with respect to the usefulness of a development interventions program can help to gear development intervention programs to the needs of different regions

and group of farmers. This helps to design more acceptable and cost effective development intervention programs.

This study is aimed to provide an insight into this less studied dimension in rural development by eliciting farmers' felt priority problems and preferences for development intervention program. Having identified farmers' preferences for intervention, the agricultural problems and socio-economic factors assumed to determine the preferences of farmers are analyzed. The underling assumption in this study is that farmers, based on their extensive knowledge of the farming environment and the outstanding agricultural problems, can state their preference for development intervention in line with their utility maximization objective, given their constraints and resource endowments. The econometric model used to determine factors influencing farmers' preferences for development intervention is the random utility model (RUM) that provides the link between a statistical model of observed data and an economic model of utility maximization. Assuming that the error terms, in the RUM, are logistically distributed the multinomial logit model is used for data analysis.