



CHAPTER 1

INTRODUCTION

This chapter defines the nature of the research problem under investigation and motivates the significance of undertaking the present study. It also sets the objectives of the study and presents the approach and methods employed to achieve those objectives and how the study is organized.

1.1 Motivations and Setting

The economic development of Ethiopia is highly dependent on the performance of its agricultural sector. This is because agriculture contributes 50% of the country's gross Domestic Product (GDP), 90% of all exports (coffee, hides and skins, and oil seeds), and provides employment for 85% of the population directly or indirectly (World Bank, 1997). Agriculture also provides raw materials for 70% of industries in the country (MEDAC, 1999). Besides, the country has the biggest livestock herd in Sub-Saharan Africa (World Bank, 1997).

In spite of its tremendous potential, the performance of Ethiopian agriculture has been disappointing in the last three decades. Its performance has deteriorated from an average annual growth rate of 2.6% between 1965-75 to less than 1% between 1975-89. During the early 1990s, average agricultural growth was 1.5% per annum (World Bank, 1997). The 1994/95 agricultural outputs were 5% lower than the 1980/81 where as population increased by 40% over the same period (Croppenstedt et al, 1999). That means, food production lagged far behind population growth leading to food shortages. The poor performance of the agricultural sector coupled with recurrent unfavourable weather conditions resulted in serious food shortages, leading to three famines in 1973-74, 1984-85, and 1987-88 (Befekadu, 1988; Teressa, 1998). Consequently, Ethiopia received significant food aid and became highly dependent on food imports (Stroud and Mulugetta, 1992; Croppenstedt et al, 1999). The country received 12%-16% of its cereal production as food aid over the 1991-94 periods. In 1994, food aid together with total food imports of 928000 tons of cereals amounted to about 16.4% of total cereals production. Moreover, in 1995 FAO estimated that food imports will grow at 6% per year and will reach 2.5 million tons by 2010 (Takele, 1996). In general food insecurity has persisted in Ethiopia especially in rural areas (Diriba, 1995). The fact that Ethiopia has become increasingly dependent



on external sources of food supply has become a major concern for policy makers and agricultural researchers. Therefore, the question of how to make Ethiopia self-reliant in food production has received major attention in recent years (EARO, 2000).

Improving agricultural production provides an important option for reducing reliance on food assistance and imports, and enhancing agricultural development (Block, 1975; Thomas, 1982; Herdt, 1984; Ruttan, 1986). The importance of improved agricultural production technology in achieving sustainable increases in food production in Sub-Saharan Africa is documented in many studies (Delgado et al., 1987; and Eicher, 1990). The green revolution model in Asia and Latin America where significant economic growth has been achieved through the introduction and adoption of improved agricultural production technologies, mainly improved seeds, fertilizers, pesticides and irrigation provides a good example for Africa (Traxler and Byrelee, 1993; Herath and Jayasuriya, 1996).

Low yield due to low adoption of improved agricultural technologies is believed to be the main factor that prevented agricultural production from coping with the rapid population growth in Ethiopia. Studies revealed that improved wheat cultivation is practiced on less than 10% of the cultivated land. Besides, the amounts of fertilizer and herbicide applied by most farmers in Ethiopia are below the recommended levels (Hailu et al., 1992; Legesse et al., 1992; Legesse, 1992). For instance, fertilizer utilization was very low (13.5 kg/ha) in cereals compared to 48 kg/ha in Kenya and 60 kg/ha in Zimbabwe (World Bank, 1995). Furthermore, the percentage of fertilizer applied to *tef* and wheat was 38.2% and 17.5%, respectively, of the total DAP and urea sold in 1995 (Croppenstedt et al, 1999).

According to previous research in Ethiopia, low adoption of improved production technologies was attributed to unavailability of appropriate technologies, unavailability and high cost of required inputs, lack of access to and high interest rates on credit, and policies that discourage



improved technology adoption such as promotion of state farms¹ (Mulugeta et al, 1992; Hailu and Chilot, 1992; Bekle et al, 2000; Getahun et al, 2000).

Increasing the rates of adoption of improved production technologies is therefore considered critical for agricultural growth in Ethiopia. Currently, the agricultural policy of Ethiopia gives high priority to increasing food production through the promotion of improved production technologies among smallholders. Particularly promoting the adoptions of improved *tef* or wheat technology packages including improved seed, fertilizers and pesticides, being the main food crops, were given high priority among all cereals. However, there is currently limited information about farmers' learning from the demonstrations of improved *tef* or wheat technologies, about the rate² and intensity of the use of improved *tef* or wheat technologies after their introduction.

The majority of adoption studies conducted in Ethiopia in the past concentrated on addressing the question of why farmers do not adopt improved agricultural technologies using cross sectional data and static models. The results of these studies were sometimes contradictory with respect to the importance and influence of some explanatory variables.

The adoption decision is a dynamic process involving changes in farmers' perceptions and attitudes as acquisition of better information progresses and farmers' ability and skill improve in applying new methods (Ghadim and Pannell, 1999). In this study adoption of part of or the full package of improved *tef* or wheat technologies over time was analysed. The research questions addressed by this study included which *tef* or wheat technologies have been adopted and why they are still in use or already abandoned after introduction. The study accordingly identified factors that influence farmer's decision to continue to use new technologies or not and measure their influences over time.

¹ During the Military Government (1974-1991), State farms received 40% of government expenditure on agriculture, 76% and 95%, respectively, of fertilizers and improved seeds while very little attention was given to smallholders who produced 95% of all grain crops (Legesse, 1998).

² Rate refers to percentage while intensity refers to level of use of a new technology (Feder et al., 1985).



1.2 Significance of the study

Understanding the factors that cause farmers to partially or fully adopt or discontinue the use of improved technological packages is crucial for improved design and transfer of the recommended practices. It is also important for researchers, extension workers and policy makers to know the pattern, intensity and dynamics of adoption and abandonment of improved packages. These information assist researchers for developing appropriate technologies that better fit the needs of smallholder farms. The generated information will also help extension to design appropriate strategies for removing barriers to higher adoption of improved production technologies by smallholders, and policy makers to increase food production in the country.

1.3 Research Objectives

The overall objective of the study is to analyse determinants of patterns³ and intensity of improved technology adoption by smallholder producers of *tef* or wheat in Ethiopia, especially the dynamics of learning in the adoption decision. Specifically, the study will pursue the following objectives:

1. Estimate the rate and intensity of improved *tef* or wheat technology adoption over time;
2. Determine the effects of experience and risk as well as other factors on the decision to continue or discontinue use of improved *tef* or wheat production technologies over time;
3. Analyse the adoption of improved *tef* or wheat technologies using panel regression models.

1.4 Approach and methods of the study

To achieve the stated objectives, this study was undertaken in *tef* and wheat based farming systems of the Northern and Western Shewa Zones of the Oromiya Regional State of Ethiopia, which respectively, represent medium and high potential *tef* and wheat production regions in the

³ Pattern refers to the cumulative percentage of users of a new technology over time (Griliches, 1957).



country. Northern and Western Shewa zones are located in the central highlands of Ethiopia, which stretch about 115 and 185 km respectively, to the north and west of the capital city Addis Ababa. The study covered the 1997-2001 agricultural seasons.

This study included farmers who were exposed to improved *tef* or wheat technologies in Northern and Western Shewa Zones. Data for the intended analysis was collected from farmers' surveys in high and medium potential areas of *tef* or wheat production. Unlike many adoption studies, straw yield and its value was considered in the data collection. A component or a package approach was employed to *tef* or wheat growers who have been using these technologies over time after exposure. The study adopted panel regression models such as Xtprobit and Xttobit to estimate random-effects probit models and random-effects tobit models, respectively, in the adoption of improved *tef* or wheat technologies over time. Farmers' decisions to continue or discontinue using the new technology and intensity of adoption change depending on their learning in using the new technology in the previous years.

1.4. Organization of the study

The study is organized into seven chapters. Chapter one presents the motivation and objectives of the research project and defines the approach and methods to be used. Chapter two provides background information on the importance of the agricultural sector to the economy at large and to food security in Ethiopia. It further gives an overview of the status of agricultural research and extension systems in Ethiopia. The theoretical and empirical literature of relevance are reviewed in Chapter 3 out of which the conceptual framework to be employed in subsequent analysis are defined. Chapter 4 develops in full detail the analytical approach and empirical methods used to conduct the analysis. Results of the economic analysis of improved *tef* and wheat technologies, and the pattern and sequence of adoption of components of improved *tef* and wheat technologies over time are presented in Chapter 5. Chapter 6 presents the results of empirical analyses of panel data regression models (Xtprobit and Xttobit) on the adoption of improved *tef* or wheat technologies. Finally, Chapter 7 brings together the major findings, draw conclusions and make recommendations to improve smallholders' agricultural productivity through the adoption of improved *tef* or wheat technologies in the study areas.