

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

By all accounts, agriculture is the mainstay of the Ethiopian economy. It generates over 45 percent of the GDP and 90 percent of the total export earnings and provides employment for about 85 percent of the labor force. Despite the importance of the agricultural sector in the overall development of the Ethiopian economy, its performance has been very poor as viewed from its frequent failure to provide food for a large segment of a fast-growing population. For instance, an estimated 50 percent of the Ethiopian population is food insecure (Befekadu and Berhanu, 1999; MEDaC, 1999) and a significant share of Ethiopia's food needs has been obtained in the form of aid over the last couple of decades. The annual volume of cereal food aid has grown from 2.3 to 23 percent of total domestic grain production over the period 1985-1996 (MEDaC, 1999). The growing gap between domestic food production and demand is attributed to the very low productivity of the agricultural sector. Accordingly, improving the productivity of the agricultural sector is believed to be the key to alleviating food insecurity and bringing about overall growth of the Ethiopian economy.

The current development strategy of the Ethiopian government focuses primarily on agricultural growth and food security. An economic reform program was initiated in 1992, which included the removal of taxation on agriculture, market liberalization and devaluation (Mulat, 1999). It is believed that food self-sufficiency can be attained through an increased use of improved agricultural production technologies following the liberalization of the input and product markets to allow private sector participation, deregulation of prices, and expansion of extension services (Techane and Mulat, 1999; Mulat, 1999). Within the framework of the agricultural development-led industrialization (ADLI) policy of the Ethiopian government, the new extension program (NEP) was launched in 1994/95 to demonstrate to farmers the benefits of a package of modern agricultural inputs, notably balanced and higher rates of fertilizer, improved seeds, pesticides, and better cultural practices.

Despite a relative increase in the consumption of fertilizer and improved seeds, however, the productivity of major cereal crops has been low. Quite often the failure to realize potential output is partly attributed to partial adoption and sub-optimal application of technology packages by farmers that is far below the research recommendations (Mulat, 1999). This may lead to inefficient use of improved technologies. Efficient technology utilization could be severely undermined by a wide range of economic, institutional, social, and cultural constraints. Efforts to increase productivity have also failed to explore opportunities within the farm to increase agricultural production through promotion of local innovative cropping practices (Mulat, 1999). Innovative farming practices could be identified, refined and promoted alongside improved technologies to help raise food production.

There is, however, little knowledge about the efficiency of farmers who have been using improved technologies and of the impact of NEP on efficiency of resource use among smallholders. Knowledge about the level of inefficiency of production under improved technology and of the underlying socio-economic and institutional factors causing that may help to assess the opportunities for increasing agricultural production and the strategies to enhance the effectiveness of NEP. This study thus aims to contribute towards a better understanding of the impact of improved production technologies in particular and that of NEP in general on the technical, allocative, and economic efficiency of smallholder farmers using extended efficiency and productivity measurement techniques.

1.2 Motivation and Nature of the Research Problem

The growing gap between food demand and supply in Ethiopia is mainly attributed to the very low productivity of the agricultural sector. Heavy reliance on obsolete farming techniques, poor complementary services such as extension, credit, marketing, infrastructure, and inappropriate agricultural policies are among the major factors that have greatly constrained the development of Ethiopia's agriculture. Despite its dominant share in the country's total agricultural output, and hence in the GDP, smallholder agricultural production lacked the necessary attention in the country's agricultural development efforts in the past and thus its productivity remained very low. One of the major policy shifts since the change of government in 1992 has been the substantial emphasis placed on improving the productivity

of peasant agriculture through increased use of a package of improved agricultural technologies.

As part of the ADLI development strategy, the Ethiopian government introduced NEP based on the experiences of the Sasakawa-Global 2000 (SG) project which embarked upon the popularization of large-scale (usually half-hectare) on-farm demonstration plots for already available improved agricultural production technologies. In formulating NEP, attempts were made to screen out and preclude the shortcomings of past extension systems. First, extension services were erroneously organized by commodity rather than by function and were prescriptive in the sense that they only transmitted information without adequate or no supply of inputs. Second, they were limited only to high potential areas of the country, neglecting other agro-climatic zones. Third, demonstration sites were not widely distributed and they were rather undertaken in fences. Fourth, extension information was not effectively communicated through different methods and budgets, manpower, and means of transport were not adequately allocated for the extension service in addition to noted inefficiency in administration and management (TGE, 1994).

NEP was thus developed against the above background aiming to improve the productivity of smallholder farmers through better access to improved production technologies such as fertilizer, improved seeds, pesticides, and better cultural practices mainly for cereal crops such as maize, wheat, and tef. The program provides credit, inputs, and extension assistance to farmers willing to participate in the program by allocating their own land for technology demonstration and settling the down payments for improved inputs. It promotes integrated technology packages developed for different agro-climatic zones, including the highland mixed farming zone, highland degraded and low moisture zone, lowland agro-pastoralist zone, and lowland pastoralist zone (Befekadu and Berhanu, 1999). Its implementation was launched in 1995/96 cropping season as an expansion of the SG package approach, primarily through dissemination of crop technologies. In 1995/96, about 36,000 half-hectare on-farm demonstration plots were established and average yields for the major crops including, maize, wheat, tef, and sorghum have increased by 98 percent and the increment was more than double for maize and wheat (Takele, 1996). In 1996/97 and 1997/98, the number of government sponsored demonstration plots was 650, 000 and 2.9 million, respectively (Befekadu and Berhanu, 1999).

The rapid expansion of NEP has taken place at a time of major changes in markets, policies, and institutions affecting the agricultural sector: a new credit system launched in 1994, gradual liberalization of the fertilizer market from 1991 to 1997, and decentralization of the government. Despite considerable yield increments obtained from the demonstration plots of the SG project in the high potential agricultural areas, knowledge about the impact of NEP on the production efficiency of farmers is very scanty. The success of NEP is believed to depend upon how well the three roles of extension, credit and input delivery meet the particular needs of smallholders. This is a situation very different from that of the SG project, which was limited to specific high potential zones with relatively better functioning credit and input delivery services. For example, NEP's credit system is more complex: there are multiple actors (banks provide credit, regional governments guarantee credit, and extension agents approve participants and collect payments); interest is charged; and local administration follows strict enforcement rules. Further, NEP needs to deal with a fertilizer sector characterized by increasing retail prices due to subsidy removal and supply inefficiencies.

There are growing concerns over NEP's effectiveness in enhancing new technology utilization and in bringing about the desired improvements in productivity. First, extension agents, apart from their own little technical knowledge about new technologies, are involved in too many non-extension tasks: processing credit applications, dealing with input distributors, mobilizing farmers for public works, and collecting loans and taxes. Second, rapid expansion of NEP to less favorable and marginal areas required more supervision and credit, than less, due to the low literacy rates and poor asset endowments of the farmers in these areas. This is expected from an extension service with a rather limited number of extension agents and dwindling credit portfolios to regions. The overall impact of increased plots per extension agent and the extra tasks is a lower quality extension message (Mulat, 1999).

In fact, in a changing technological and policy environment, it is argued that farmers encounter considerable inefficiencies before the realization of the intended gains from technological progress. New technologies can yield better results only under better management of farm resources to efficiently use a package of modern inputs and agronomic practices. However, farmers lack information and managerial skills to be able to fully exploit the productivity potential of new technologies. New technologies demand a new set of skills and knowledge, integration into the input and product markets, and access to infrastructure,

credit and educational services if their productivity-enhancing potentials are to be fully exploited. Neither the extension service is strong enough to provide adequate and timely technical advice on new methods and procedures and market information nor are there adequate credit and infrastructural facilities for farmers to have easy access to inputs and markets for optimal input use. Deviations of farmers' practices from technical recommendations coupled with sub-optimal input choices will ultimately lead to both technical and allocative inefficiencies.

What's various inputs

Farmers thus experience greater production inefficiency and hence loss of potentially obtainable output from new technology due to lack of familiarity with the new technology, market information, and credit. Like in other developing countries, the technical efficiency of traditional food crop production has been researched in Ethiopia (e.g., Assefa, 1995; Assefa and Heidhues, 1996; Getu et al., 1998; Getachew, 1995). However, the efficiency of modern crop production has received little or no attention partly because of the wrong assumption that farmers' constraint is the choice of appropriate technology and not the efficient use of a technology. Further, previous studies dealt exclusively with technical efficiency of farmers. While physical productivity considerations are important, improvements in allocative efficiency could yield greater benefits to agricultural producers using improved technologies in Ethiopia. In view of the steady liberalization of the input and product markets since 1993, knowledge about farmers' production efficiency and the underlying constraints under improved technology is extremely valuable for policy makers. This will help enhance the effectiveness of the various support services and thus bring about the desired growth in agricultural productivity and food security in the country. This study thus attempts to address such a noticeable lack of knowledge about the efficiency and productivity impact of new technologies in particular and NEP in general.

1.3 Objectives of the Study

It is argued that there is a considerable lag between farmers' attempt to adjust their production decisions to keep pace with changes in the technological and economic environment and achieving the ultimate efficient use of their resources. Ali and Byerlee (1991) pointed out that agriculture in much of the third world has experienced profound changes and can no longer be classified as traditional. In this new situation, the scope for inefficiencies in resource use is

much greater and hence development strategies may need to be re-examined. In Ethiopia, based on the encouraging SG project experiences of high cereal yields obtained from selected high potential agricultural areas, there was a growing optimism that new and improved agricultural technologies widely promoted through NEP would bring about substantial increases in food production. Unfortunately, cereal yields have not improved despite increased use of packages of improved technologies owing to concerted efforts made through NEP.

Whilst various incentive measures have been used to induce farmers to achieve a high rate of adoption of the chosen modern technologies (use of fertilizer, improved seeds, and chemical inputs), little effort has been made to ensure appropriate application and more efficient use of these technologies. This is partly attributed to the wrong hypothesis that farmers may not be able to select appropriate technologies but can nevertheless operate technology efficiently when chosen for them. This may have contributed to the poor field performance of the new technologies. Mulat (1999) indicated that the yield levels of major cereal crops remained too low to justify the substantial investments in the modern inputs used. Cereal yield increased by only 0.3 percent per annum between 1990 and 1997 and there is no indication that yields have significantly improved since 1994 despite the sharp increase in the use of fertilizer and other inputs.

The main objective of this study is thus to measure the impact of NEP on the technical, allocative, and economic efficiency of smallholder farmers and to identify the underlying factors in eastern Ethiopia. This is accomplished by pursuing the following specific objectives:

1. To measure the crop level technical, allocative, and economic efficiency of production under traditional and improved technology;
2. To measure the farm level technical, allocative, and economic efficiency of production under traditional and improved technology across agro-climatic zones;
3. To identify the major social, economic, and institutional factors influencing technical, allocative, and economic efficiency of smallholder farmers; and

4. To measure the total factor productivity and resource use efficiency of alternative cropping systems and technologies.

1.4 Significance of the Study for Policy, Research, and Extension Services

The capacity to develop and manage technology in a manner consistent with a nation's physical, human, and cultural endowments is the single most important variable accounting for differences in agricultural productivity among nations. The development of such capacity is dependent on the following factors. (1) The capacity to organize and sustain the institutions that generate and transmit scientific and technical knowledge. (2) The ability to embody new technology in equipment and materials. (3) The level of husbandry skill and the educational accomplishments of rural people. (4) The efficiency of input and product markets and the effectiveness of social and political institutions (Ruttan, 1988).

Although agriculture in developing economies has undergone considerable technological change since the Green Revolution, there have been evidences of substantial inefficiency in agricultural production due to farmers' high unfamiliarity with new technology, poor extension and education services, and poor infrastructure, among others (Ali and Chaudhry, 1990). An investigation of farm level productive inefficiencies and the underlying causes associated with the use of improved agricultural technologies greatly helps policy makers to take the necessary corrective measures for enhancing agricultural production through better and efficient use of these technologies alongside the limited farm resources. The study will help generate knowledge that will serve as the basis for making sound policy decisions as part of the economic reform and adjustment program with a view to enhancing the effectiveness of NEP in the realization of the intended food security and agricultural development objectives.

Knowledge about the extent of production inefficiency under improved technology and the associated responsible factors will greatly help policy makers to explore untapped potentials of new technology and increase food production with existing resources by addressing the identified constraints. It also enables the identification of those farmers who need the most support from the government and hence helps for better targeting and priority setting. Further, knowledge about production efficiency gaps between users and non-users of improved technology will inform policy makers of the impact of improved agricultural technologies and

the extension program, which is very valuable for better design and implementation of intervention programs. Knowledge about agro-climatic variations in production efficiency and the respective inefficiency factors will also be extremely useful for decision makers in their endeavor to design appropriate strategies to solve farmers' problems in different agro-climatic zones. The study will also contribute to the literature on production efficiency in the context of a changing agriculture and the appropriate analytical methodologies to deal with the same.

1.5 Organization of the Thesis

In addressing its main objective of assessing the production efficiency of smallholders under the unfolding new economic environment in Ethiopia, this study addresses a wide range of issues in its various chapters. Chapter two provides an overview of the agricultural development policies and strategies pursued in the country with the aim of identifying their impacts on smallholder productivity as one important dimension of the performance of smallholder agriculture. Chapter three gives a detailed account of the theoretical and empirical issues relating to technical, allocative, and economic efficiency and establishes the framework for the intended analysis. Chapter four is devoted to the description of the study areas and selected socio-economic characteristics of the sample households. It examines the role of the various cropping strategies practiced by the smallholders and identifies those offering greater opportunities to the farmers in terms of efficiency of resource use in the face of decreasing farmland and adverse climatic conditions.

Results of the empirical investigation of the level and variability of smallholders' efficiency of production both at crop and farm levels are presented in chapters five and six, respectively. The last chapter brings together the major findings, draws conclusions and makes recommendations with a view to improving smallholder agricultural productivity and efficiency in the study areas. Based on the literature surveyed as well as the empirical results obtained, it also draws relevant generalizations that could help tackle stagnating cereal productivity in the country.