Economic Efficiency and Marketing performance of Vegetable Production in the Eastern and Central Parts of Ethiopia

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Abstract

The objective of this thesis is to examine the production and marketing performance of vegetables in the eastern and central parts of Ethiopia. Efficiency estimation and identification of their determinants in mixed-crop and market-driven (vegetables) production systems was performed in two districts of eastern Ethiopia. A significant economic inefficiency was observed for both systems, with lower efficiency scores for the market-driven farm production. The improvement in efficiency calls for institutional capacity building that enhances asset and capital formation, extension and credit services, consumption and family planning know-how and crop specialization. Results based on the comparison of the two production systems show that lower economic efficiency scores for the market-driven production is attributable to limited access to capital markets, high consumer spending, and large family size. Furthermore, an assessment of the marketing performance of vegetables is conducted. Since most produce sales are based on relational contracting with traders, the study of market performance encompasses an analysis of grower-trader marketing contract enforcement and factors influencing it. Results show that despite its poor performance, contract enforcement is mainly due to mutual trust and brokers' mediation. Information access, trader-specific investments, farmer's age, whether the buyer is a trader, dependency on the trader, relationship duration, transaction frequency, and distance to the trader were found to be the significant factors affecting contract enforceability through brokers. Risks related to perishability and seasonality of supply, illiteracy, and client-buyer's type were found to be the significant factors causing contract breaches by the traders. In addition, traders' produce pricing behavior in the procurement of vegetables from growers is analyzed. Results show that traders capture a significant proportion of the marketing surplus due to market power and audacity to absorb risk with this share varying along the degree of perishability and across cities. In general, the results of this study reveal the existence of considerable economic inefficiency in production, poor contract enforcement, and imperfect competition in the marketing of vegetables. The findings of this study indicate the need for governmental and/or private institutions interventions to improve the production and marketing performance of vegetables by providing the necessary institutional support to the smallholder farmers in the study areas.

Keywords: Efficiency, DEA, SFA, Tobit, contract enforcement, brokers' mediation, trust, oligopsony power, risk bearing, vegetables, Ethiopia.

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Dedication

To my father Haji Mohamed and to my sister Teyba. May their gentle and loving soul rest in peace.

Contents

List of Publications

This thesis is based on the work contained in the following articles, referred to by Roman numerals in the text:

I Haji, J. (2007). Production Efficiency of Smallholders' Vegetable-dominated Mixed Farming System in Eastern Ethiopia: a Non-parametric Approach. *Journal of African Economies* 16(1), 1-27.

II Haji, J. & Andersson, H. (2006). Determinants of Efficiency of Vegetable Production in Smallholder Farms: The Case of Ethiopia. *Food Economics-Acta Agricult Scand C* 3(3), 125-137.

III Haji, J. The Enforcement of Traditional Vegetables Marketing Contracts in the Eastern and Central Parts of Ethiopia (manuscript).

IV Haji, J. Traders' Oligopsony Power and Risk–bearing in Procuring Vegetables from Farmers: The Case of Ethiopia (*Submitted to Economic Systems*).

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1 Introduction

After Schultz's (1964) poor-but-efficient hypothesis was proved invalid, most studies on the economic growth of developing countries focused on improving resource use efficiency as an alternative and less costly means of increasing productivity. If Schultz's hypothesis had been confirmed, an increase in farm productivity would only have been achieved through increased use of inputs and technology introduction. On the other hand, if inefficiency prevails, increases in productivity might be attained through efficient use of the existing resources and addressing the socio-economic and institutional factors confounding it. In a poor country such as Ethiopia where technology introduction and increasing inputs are hardly possible, the identification of the extent of resource use inefficiencies in production of high value crops with export potential given the existing technology and input levels are crucial and relevant policy issues.

Given the recent and previous government's economic policies that aim at improving farm productivity and market performance of high value crops with export potential, detailed and systematic empirical studies on the production and market performance of vegetables in Ethiopia are scarce or non-existent. Moreover, despite the huge production potential due to favorable weather conditions and the availability of irrigation sources, and dire demand at export markets, the question why the export earning from vegetables is so low, 2.2% of Kenya's export earning (Anita & Andre, 2002) remains mysterious to policy makers and economists. This might be due to lack of necessary technical and managerial production skills, poor contract enforcement, imperfections in the marketing chain, and lack of market related institutions and infrastructure.

An improvement in the production and marketing performance of high value crops with export potential might bring about an improvement in the livelihood of the most populous smallholder farmers due to the positive relationship between farm productivity, marketing efficiency, and economic growth (Hulten, 2000; Easterly & Levine, 2001; Rachel, 2001). Moreover, the production of commercially oriented high value crops has a number of advantages. It improves the performance of markets (Ruben & Pender, 2004), contributes towards new employment opportunities (Oskam et al., 2004) and stabilizes export earnings (Alwang & Seigel, 1994).

One of the main objectives of the recent economic policy of the government of Ethiopia under a plan for Accelerated and Sustained Development to End Poverty (PASDEP) is the diversification of production and exports. Given this goal, shifting farmers from traditional (semi-subsistence) farming practices to cash crop production is required. In Ethiopia, the actual share of resources allocated to semi-subsistence food production is much higher than the share of resources allocated to cash crops (Jaleta, 2007). Hence, economic policies that require shifting producers' farming practices from semi-subsistence to market-oriented production systems require an analysis of the performance of the two production systems and the marketing of these products as well as factors affecting production and marketing performances. Moreover, the shift from semi-subsistence production to commercially oriented farming systems is hindered by various economic factors: high risks (Fafchamps, 1992), high transaction costs (Omamo, 1998; Key, Sadoulet & de Janvry, 2000), limited availability of markets (De Janvry, Fafchamps & Sadoulet, 1991), limited insurance options (Binswanger & Rosenzweig, 1986), and limited access to credit (Eswaran & Kotwal, 1986). Hence, government's agricultural development policies that aim at promoting the participation of smallholder farmers in the production of non-traditional agricultural commodities for exports need to focus on identifying factors that affect households' production and marketing decisions. Estimating the extent of inefficiency in production and the imperfections in the markets, and identifying factors that determine these levels is important for designing appropriate policies of interventions. A separate but related study that investigates production and marketing performance of high value crops (vegetables) in two zones of Oromia region and three main cities in Ethiopia is therefore undertaken to contribute towards the larger government's priority policy area (diversifying production and export trade).

This thesis is a summary of the main results from four interrelated studies. The first two articles are devoted to the analysis of the production performances of mixed–crop farming and vegetables production whereas the remaining two articles are devoted towards market performance assessments of vegetables. The thesis is organized as follows. Section 2 provides general background of the thesis. In this section, issues related to agricultural productivity and marketing in Ethiopia are discussed. Section 3 presents the objectives of the study. Section 4 presents a review of literature on production and marketing performances. Section 5 contains a description of the data and empirical procedures. Section 6 presents study results. Section 7 provides concluding remarks and policy implications. Section 8 presents the contributions of the study in relation to the existing literature on production and marketing performances of perishable agricultural commodities. Section 9 provides future research options in the area.

2   General Background

2.1   The Ethiopian economy and agricultural policies

Despite the huge wealth of productive land, labor, and natural resources, Ethiopia remains one of the poorest countries in the world. Nearly half of its population is food insecure or live below poverty line (WHO, 2007). The question is why Ethiopia is unable to feed its citizens, given the agro-ecological diversity and the huge production potentials. Is it because of the inability to create or adopt improved technologies? Is it because of the improper utilization of the existing resources? Is it due to imperfections in the marketing chain or the inability of the market to coordinate production? Is it due to ill–devised economic policies? These are important questions that need to be addressed. The Indian Nobel prize winner Amartya Sen (1999) argued that famine is not an indication of shortage of food, but could be due to the inability of the market to coordinate supply and demand. A large number of studies on productivity and marketing argue that resource use and marketing inefficiencies play significant role in stagnating economic growth (e.g., Rachel, 2001; Easterly & Levine, 2001). Another Nobel Prize winner, Douglas North (1990), argues that poor contract enforcement has a significant impact on economic stagnation and underdevelopment. Moreover, Douglas North (1990) reiterated that the development opportunities of a country are not necessarily affiliated with technological solutions to production and distribution, but in restructuring institutions to promote economic exchange and growth.

Ethiopia's economy is heavily dependent on agriculture. It accounts for about half of GDP, 90% of exports, and 85% of total employment. Ethiopia stands third in the world and first in Sub-Saharan Africa in terms of the share

of GDP that stems from agriculture (Block, 1999). Coffee generates 53% of the export revenues with *t'chat* second (EEPA, 2002). Other export commodities include oilseeds, horticultural crops, livestock, and their products. The average share of horticultural crops from export earning remains meager, 1.27% (EEPA, 2002). Out of the export quantity, Djibouti and Netherlands account for 56% and 22% while the rest is exported to United Arab Emirates. Ethiopia also exports some processed fruits and vegetables to Yemen, Saudi Arabia and other Middle East countries. The two most important processed products are oranges (as canned or bottled orange juice) and tomatoes (as ketchup tomato paste and tomato concentrate). Of the Ethiopian landmass of 111.5 million hectares, nearly two-thirds is viable for agricultural production. Proper utilization of these resources might considerably improve the livelihood of the most populous smallholder resource-poor farmers and pastoralists. Out of the viable land, only about 33% is operated. About 96.8% of the total agricultural land is cultivated by smallholder farmers that produce 97.6% of the agricultural output. Vegetables constitute 2.7% of the total area of all crops in 2005/06 (EEA, 2007).

After the fall of the socialist regime in 1991, the country set forth a series of economic reform programs to facilitate transition from a command economy to a market oriented system. In 1991, the country embarked upon an economic reform program initiated in the form of Structural Adjustment Programs (SAP) which is geared towards realizing economic growth and poverty reduction. Because of the agrarian nature of the country's economy, SAP was augmented by Agricultural Led Development Industrialization (ADLI) in 1993 that aimed at reducing poverty, and ensuring a dynamic and self-sustained growth through increase in agricultural productivity. In the process of implementing SAP, Ethiopia developed the Interim Poverty Reduction Strategy Paper (I-PRSP) in 2000 and launched the full PRSP known as Ethiopia's Sustainable Development and Poverty Reduction Program (SDPRP) in 2002. The latter program targeted economic growth of 7% per annum in an attempt to reduce poverty by half in 2015. Three years later, the second phase of the PRSP process, a plan for Accelerated and Sustained Development to End Poverty (PASDEP) was introduced as a guiding strategic framework for the next five years to follow. PASDEP aims at human development, rural development, food security, and capacity building with the main focus on the commercialization of agriculture.

Compared to the previous poverty reduction strategy, PASDEP places much greater emphasis on commercialization of agriculture, diversification of production and exports, and private sector investments to move away farmers from subsistence farming to small-scale market-oriented agriculture. The PASDEP strategy, above all, gives priority to the enhancement of farm productivity and competition, increasing efficiency in agricultural input and output markets, strengthening the rural credit system, improving irrigation and water management, and the creation of a favorable atmosphere for commercial agriculture. However, given the series of stabilization and structural adjustment programs, the country's efforts towards improving export earnings, especially from non-traditional and manufacturing sector, remains inadequate (EEA, 2005).

2.2 Agricultural productivity and marketing in Ethiopia

2.2.1 Farm productivity

According to Taffese (2005), the agricultural sector in the years between 1962 and 2002 grew at a rate below the population growth, which is about 2.9% (CSA, 2006).The ability of the Ethiopian economy to experience accelerated growth both in the short and in the long-run depends on the exploitation of the potentials within the sector that employs the vast majority of the population, and accounts for the larger shares of the export earnings and GDP, agriculture. The importance of this sector is reflected in the earlier ADLI and the current economic reform program under PASDEP, which stipulates an increasing attention towards rural development. The Ethiopian government has put in much effort in promoting agricultural productivity and efficiency of the smallholder farmers through the introduction of modern inputs and institutional interventions. However, according to The RATES Center (2003), agricultural productivity in Ethiopia is very low even compared to other Sub-Saharan African countries. The lower contribution of the agricultural sector to GDP while employing the vast majority of the population is also an indication of the low productivity of this sector. Various reasons are forwarded for the low productivity of this sector. Poor and backward technology, limited use of modern inputs, lack of transportation and storage facilities, inadequate credit facilities, natural calamities and ill-devised policies (Assefa, 1995), imperfections in the marketing chain (Holden & Shiferaw, 2003; Osborne, 2005; Jaleta, 2007) and lack of strong public and/or private institutions that facilitate contract enforcement and stabilize markets (Gabre-Madhin, 1999).

Studies on farm productivity have long been recognized in the literature in developing countries (Martin, 1992). Recently, economic theories have shown that productivity is the viable engine for sustainable long-term economic growth (Hulten, 2000; Easterly & Levine, 2001). However, little is known about the productivity of vegetable farming and factors influencing it in Africa in general and in Ethiopia in particular.

Because of the reduction of land size per farm due to increased population pressure, the traditional system of generating soil fertility through the use of fallow has decreased. Intercropping and crop rotation have become common. If farm households are to feed themselves and produce a marketable surplus with less land per capita, they need to adopt new farming practices and increase their efficiency in using the available technologies. The ability of a country to achieve growth in agricultural productivity and output depends on its ability to use the available resources efficiently and make an efficient choice among alternative paths of technical changes (Mulat, Said & Jayne, 1997; Xu & Jeffrey, 1998). Despite considerable attempts to introduce improved technologies and extension activities, the reason why the productivity of the agricultural sector is so low remains a challenge in the road towards agriculture based economic growth. Government's attempt to increase agricultural production through increased use of improved technologies has proved not to bring about the expected productivity gains maybe due to a lack of the necessary technical skills and knowledge in using these technologies, poor extension and credit services, and poor infrastructure, among others (Mulat, 1999; Mohamed, 1999; Arega & Rashid, 2005). According to Torkamani & Hardaker (1996, p. 82) the introduction of new technologies given the aforementioned constraints has the "*danger of trying to rediscover the wheel*". Therefore, measuring the resource use inefficiency and identifying factors that affect it and designing appropriate policies for mitigating the impediments may be more important and less costly than trying to introduce improved technologies. A large number of studies on farm productivity in Ethiopia from different regions and sectors have found that inefficiency exists (Mulat, 1989; Abrar, 1995; Abay & Assefa, 1996; Corppenstedt & Abbi, 1996; Getu et al., 1998, Seyoum, Battese & Fleming, 1998; Arega, Manyong & Gockowski, 2006). Moreover, the studies show that the socio-economic, institutional, and human capital factors that cause inefficiencies show spatial, temporal, and product type variation.

2.2.2   Marketing of agricultural products

Since the adoption of the new economic policy in 1991, agricultural markets have been reformed and prices of commodities are determined through market mechanisms. However, due to the weak bargaining power of producers and harvest fluctuations, the "price free" notion of markets have been found to affect producers (EEA, 2004). Agricultural product markets in Ethiopia are characterized by seasonal gluts and shortages which in turn affect the marketing behaviour of producers, traders, and consumers. A year of bumper harvest might be followed by a year of severe drought, for example in the years 2002 and 2003 (EEA, 2004). Most previous studies argue that the fate of Ethiopia's economy is at the mercy of the whim of weather conditions. Due to widespread market failures and imperfections in the marketing chain, donor agencies and government experts have realized that the idea of sole reliance on market forces does not work, and recommend institutional intervention in the price formation of agricultural products (EEA, 2004).

African markets are typically undercapitalized and inefficient (Gabre-Madhin, 2003, Fafchamps, 2004). Product price variations, transaction costs, and risks are high. Less-developed agricultural markets hinder the linkages between agricultural and non-agricultural sectors, cause disincentives for production and reduce export earnings (EEA, 2004). The contribution of well functioning agricultural markets to the modernization of agriculture is sufficiently documented in both theoretical and empirical literature. Thomas et al. (1997) argued that well functioning input and output markets may help farmers acquire and use productivity enhancing inputs, assure vertical integration and coordination functions (input supply, credit, output marketing) and provide alternative employment opportunities.

The Ethiopian government's agricultural policy also defines agricultural marketing as a key element of rural growth, poverty reduction, enhanced food security, and addressing the needs of a growing population in both rural and urban areas. Previous studies on the marketing of agricultural products, especially grain (Gabre-Madhin, 2003; Negassa, Myers & Gabre-Madhin, 2004; Osborne, 2005) have found evidence of imperfect competition in the marketing of these produce. According to Mulat (2000), the Ethiopian agricultural output markets are characterized by an inadequate transportation network, limited number of traders with inadequate capital and facilities, high handling costs, inadequate market information system,

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weak bargaining power of farmers, and underdeveloped agro-industrial sectors.

Jaleta (2007) investigated the role of markets in the smallholder farmers' resource allocation for subsistence food crops and commercial cash production. The results revealed that limited marketing outlets and lack of price information were the major factors that hindered the move from subsistence farming to cash crop production. Furthermore, Emana & Gebremedhin (2007) described lack of local markets to absorb supply, low produce prices, plethora of intermediaries, and lack of marketing institutions and coordination among farmers as the major constraints on the marketing of horticultural crops in Ethiopia. In addition, Emana & Gebremedhin (2007) argued that poor product handling and packing, imperfect pricing systems, and lack of transparency in market information are also among the impediments in the marketing of horticultural crops in Ethiopia.

3 Objectives of the Study

The general objective of this study is to examine the farm level efficiency of vegetable production and the performance of markets for these products. The specific objectives of the study are to:

i. Estimate the farm-level efficiency of mixed-crop farming system and vegetable production, and identify the sources of efficiency differentials among farmers for both production systems.

ii. Compare factors affecting the efficiency of mixed-crop and vegetable farming systems.

iii. Analyze how the marketing contracts between growers and traders are enforced and the role that brokers play in enforcing the contract.

iv. Identify the determinants of contract enforceability through brokers and traders' non-compliance to contractual obligations.

v. Examine traders' produce pricing behavior in procuring vegetables from growers.

4 Review of Literature

4.1 Efficiency

Efficiency is the most widely used concept in economics. It is measured by comparing the observed output against the feasible (frontier) output. The scarcity of resources is the major factor that makes the improvement in efficiency so important to an economic agent or to a society. In economics, terms such as efficiency, productivity, technology growth, and economic growth are very widely used and sometimes interchangeably. However, although there are similarities and linkages among them, they are not equivalent. The conceptualization and measurement of efficiency relies on the specification of a production function. The production function represents the maximum output attainable from the use of a given level of inputs. The production function describes production performance and productivity is the measure of it. Algebraically, productivity is defined as the ratio of the amount of output produced to the amount of resources used. However, efficiency is the ratio of the value of output produced to the cost of inputs used. By efficiency, here, we mean economic efficiency, which is a combination of technical and allocative efficiencies. Technical efficiency is the ability of the farmer to produce maximum output from a given level of inputs while allocative efficiency measures the ability of the farmer to use inputs in optimal proportions, given input prices.

First, let us examine the difference between efficiency and productivity by taking a one input and one output case. Consider a production frontier described by the curve OG and a farmer operating at a point A (Fig. 1). The farmer operating at point A is technically inefficient because he could increase the output to the level of the farmer that is operating at point B

without requiring more input. However, the productivity of the farmer operating at point A is given by the slope of the ray through the origin and point A, which is equal to x/y. If the farmer operating at point A were to move to the technically efficient point B, the slope of the line would be greater, indicating higher productivity at point B. However, by moving to the point C, the ray from the origin is tangent to the frontier and hence represents the point of maximum possible productivity, which is a productivity increase attained by scale economies. Hence, a farmer may be technically efficient without being attaining optimal productivity level.
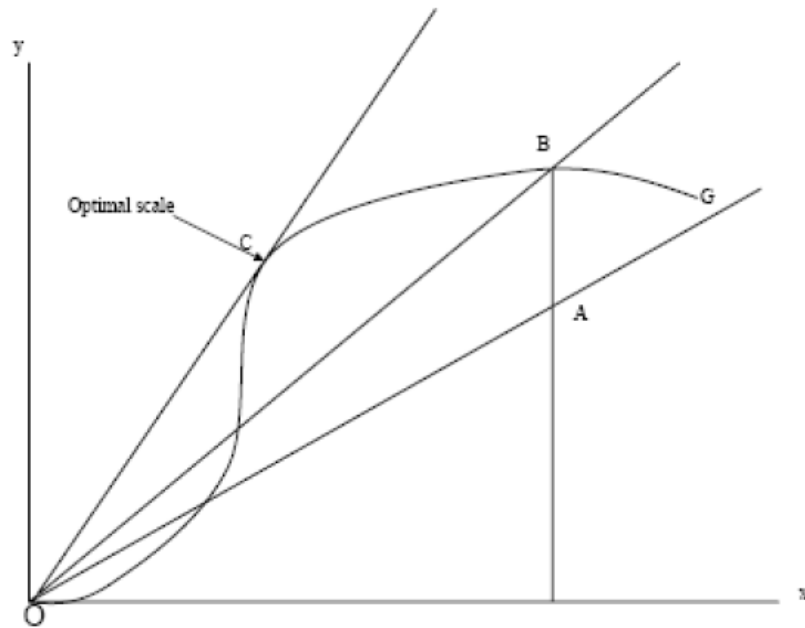

Figure 1. Productivity, technical efficiency and scale economies (Coelli, Christopher & Battese, 2005)

Next, let us examine the difference between productivity and economic growth. By using the production function, it is also possible to describe the mechanism of economic growth. Economic growth is an increase in production achieved by an economic community. Production may be increased through a variety of ways. First, through increased use of inputs usually called the horizontal expansion. In order for the farmers to increase their input use, either output prices must increase or the input prices must

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fall, or both, which have little applicability for the resource poor smallholder farmers in Ethiopia. The second source of economic growth is that attained through improvement in efficiency of resource utilization usually referred to as the improvement approach. This approach requires the improvement of conditions or the removal of some of the existing institutional constraints that hinder farmers from using the existing resources efficiently. The third source of economic growth is what is usually referred to as the transformation approach. It is economic growth attained through improvement in technologies (technical changes) that results in shifting the production function upward (Fig. 2). This approach is also less applicable in Ethiopia because it is costly and demands a new set of skills and knowledge. The fourth source of economic growth is the impact of the environment in which the production takes place. For example, good weather tends to increase output, but bad weather hinders it. The latter three sources of economic growth are termed as the productivity factors or sometimes called total factor productivity (TFP). Hence, productivity changes due to differences in production technology, differences in efficiency of the production process, and differences in the environment in which the production takes place. Therefore, economic growth can be attained either by increasing the production inputs and/or by increasing productivity. In general, an increase in production inputs results in a move along the frontier while increase in productivity leads to a shift in the frontier (Fig. 2).

According to Ahearn et al. (1998), increased productivity in agriculture has a number of advantages. First, it increases the flow of resources from one sector to the other thereby enhancing economic growth. Second, a higher level of agricultural productivity results in lower food prices that increase consumers' welfare. Third, productivity growth improves the competitive position of a country's agricultural sector. Recent studies argue that differences in TFP explain most of the variations in per capita income observed across countries (Aiyar & Feyrer, 2001; Easterly & Levine, 2001; Aiyar & Dalgaard, 2005).
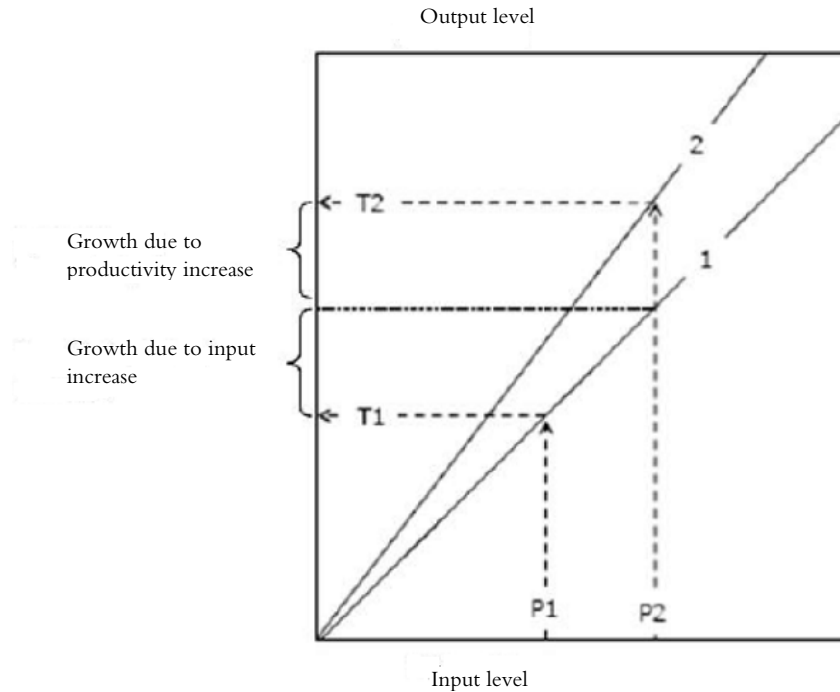
Output level

Growth due to
productivity increase

Growth due to input
increase

T2

T1

2

1

P1

P2

Input level

Figure 2. Components of economic growth (Saari, 2006)

Since the seminal work of Farrell (1957), there are two widely used methods of measuring the efficiency of a decision making unit: the non-parametric Data Envelopment Analysis (DEA) and the parametric Stochastic Frontier Analysis (SFA). The strengths of the stochastic frontier approach are that it deals with the stochastic noise and permits statistical tests of hypotheses pertaining to the structure and the degree of inefficiency. Its main weakness is the assumption of an explicit functional form for the technology the distribution of the inefficiency terms (Hjalmarsson, Kumbhakar & Heshmati, 1996). The non-parametric method initiated as Data Envelopment Analysis (DEA) by Charnes, Cooper & Rhodes (1978) builds on the individual firm evaluation of Farrell (1957). The method extends the engineering ratio approach to efficiency measures from a single-input, single-output efficiency analysis to multi-input, multi-output situations. In contrast to the parametric approach, DEA does not require any assumptions about the functional form. The efficiency of a Decision-Making Unit (DMU) is measured relative to all other DMUs with the simple restriction that all DMUs lie on or 'below' the efficient frontier. That is, a piecewise-linear convex isoquant is constructed

such that no observed point lies to the left or below it. In general, a large number of studies on efficiency measurements argue that a researcher can safely choose any of the methods since there are no significant differences between the estimated results (Abdourhmane, Bravo-Ureta & Teodoro, 2001; Coelli, Sandura & Colin, 2002).

In efficiency analysis, it is not only the level of inefficiency that is important, but the identification of the socio-economic and institutional factors that cause it. Even though the approaches for the identification of these factors may vary to some extent with the methodology employed, the most commonly followed procedure in both approaches is what is usually referred to as the two-step procedure. First, the efficiency or an inefficiency index is estimated. Second, the inefficiency or efficiency index is taken as a dependent variable and is then regressed against a number of other explanatory variables that are hypothesized to affect efficiency levels (Assefa, 1995; Coelli, Sandura & Colin, 2002). However, for the stochastic frontier approach, a number of authors (e.g. Kumbhakar, Ghosh & McGuckin, 1991; Battese & Coelli, 1995) use a specific model that allows for the estimation of efficiency scores and simultaneously test for the effect of explanatory variables noting that the two-stage testing procedures introduce some bias in estimation. For the non-parametric DEA method, a recent study by Simar & Wilson (2007) employed single and double bootstrapping methods by describing a coherent data-generating process (DGP) consistent with the regression of DEA efficiency scores on some covariates in a second stage. This methodology enables them to circumvent the inherent dependency problem of the DEA efficiency estimates and make a valid inference (Simar & Wilson, 2007).

4.2   Relational contract enforcement

Lyons (1996, p. 27) defined contract as "an agreement which is legally enforceable or legally recognized as creating a duty". This is the definition of a contract from a legal perspective. However, agreements can also be informal, oral or just plain understood which might obviously be difficult to enforce in the court of law. Economists have adopted a broader definition of contract. When every one buys or sells something, a contractual relation is established (Lyons, 1996; Fafchamps, 2004). Contracts can be categorized into two broad classes: formal and informal. Formal contracts allow complete characterization of the relationships between parties. However, in

the informal or relational contracts, the whole range of obligations cannot be defined *ex ante*. Relational contract does not take into account all future contingencies but are long-term arrangements in which past, present, and expected future relations among contracting parties matter (Lyons, 1996). Hence, contracts may vary from a lengthy negotiated document drafted by lawyers, to an implicit agreement, formed and executed without thoughts.

The next question is why contracting? Parties may enter into contracts for a number of reasons: e.g., risk sharing, market assurance, improved incentives, quality and quantity assurance and efficiency. Moreover, contracts may allow farmers to get access to credits, inputs, information, and services they need to cultivate and market lucrative non-traditional crops (Morrissy, 1974; Glover, 1984; Williams & Karen, 1985; Key & Runsten, 1999). It also creates employment opportunities, development of infrastructure, and markets in the local economy (Key & Runsten, 1999). Moreover, contract farming has been shown to reduce public expenditures for credit programs, induce crop price supports, input subsidies, and government research and extension programs (Dirven, 1996; Schejtman, 1996). Contract farming has also been found to reduce crop price variations, which enables farmers to bear the risk of non-traditional crop production (Key & Runsten, 1999). However, some studies have found evidence that contract farming have been directly or indirectly harming producers (e.g., Glove & Kusterer, 1990; Little & Watts, 1994). In Africa, contract farming has also been observed to disrupt power relations and increase tensions within farm households (Carney & Watts, 1990). Contract farming has been found to induce monopsony power of buyers (Grosh, 1994), limit the number of crops to be grown and also affect the cropping patterns (Key & Runsten, 1999) leading to a limited exit options. This, in turn, reduces farmers' bargaining power and forces them to accept less favorable contract terms.

The enforcement of contract enforcement is crucial for efficient marketing and investment and economic development (North, 1990; Gow & Swinnen, 2001; Woodruff, 2002; Beckmann & Boger, 2004). Contracts can be enforced through private and/or public institutions. On the other hand, real-world situations indicate that contract enforcement through public institutions, especially for perishable agricultural commodities is not an ideal phenomenon. Allen & Lueck (2003) also argue that agricultural contracts between landlord and tenants, between a farmer and a trader or an integrator, are often simple and informal and in many cases not even

written. This might be because of the difficulty in verifying some of the variables (e.g., quality) in court and that simplicity by itself is efficient. Informal contracts have an advantage over the formal law enforced contracts since parties that engage in an exchange may have better information than any third party. Its disadvantage is that it might cause parties to stick to the already established relationship rather than working with new partners, thereby creating barriers to entry (Johnson, McMillan & Woodruff, 2002).

Relational contract studies began with Macaulay (1963) who argued that reliance on detailed contracts was inappropriate because such planning indicates lack of trust and blunts the demand for personalized interactions. After his seminal work, a large number of studies analyzed relational contracts although the extent of the analyses in capturing their unforeseeable components deepens through time. The theory of relational contracts and its empirical research has its own difficulties (Tirole, 1999; Maskin, 2002; Wu & Roe, 2007). The standard principal agency model is less suitable because it assumes institutions for third party exist and function properly (Wu, 2005). Apart from the theoretical issues, there has been a paucity of data for studying relational contracts. This is because relational contracts are often supported by numerous unwritten rules, implicit incentives, and tacit expectations which make it difficult to find observational data that capture every important aspects of the contracting environment (Wu, 2005). Nonetheless, MacLeod & Malcomson (1989), Levin (2003), and Fafchamps (2004) developed models of relational contracts which provided a promising framework towards the accommodation of the unforeseeable components in these types of contracts (Wu, 2005).

There are two major approaches to the study of relational contract enforcement: the New Institutional Economics (NIE) and the Experimental Economics (EE). The NIE paradigm argues that all contracts include provisions for, and/or are backed up by mechanisms to support their implementation. It further provides an explanation of the existence and characteristics of these mechanisms that relate them to the diversity of contracts. The NIE categorizes solutions to the problem of relational contract enforcement as the repeat purchase mechanism (Klien & Leffler, 1981) and the efficiency wages (Shapiro & Stiglitz, 1984). The experimental economics approach, on the other hand, allows for the control of the trading environment and creates exogenous variation in the third–party enforcement, which in turn allows the researcher to isolate and estimate causal relationships (Wu & Roe, 2007).

The importance of trust among trading partners to the development of complex economic relationships and the enforcement of relational contracts has been recognized by a large number of contract literature (Woodruff, 2002). Trust can be maintained either through formal, bilateral or reputational means. Contract literature argues that informal contractual relationships–bilateral and reputation based–substitute for formal contracting in supporting trust in business relationships (Macualy, 1963; Kranton, 1996). That means, in the absence or limitation of contract laws, the identity of the trading partner is of a great concern to the parties. They prefer to trade exclusively with the same partner for long period of time. As a consequence, trust develops over time and bilateral relations thoroughly dominate the market.

Recent trends in contract literature emphasize the significant role of private institutions in enforcing relational contracts. Private institutions have been found to strengthen and enforce contracts by matching partners and joining a harmed party in sanctioning a deviant partner (Ellickson, 1991; Greif, 1993; Greif, Milgrom & Weingast, 1994). The absence of formal law or state enforcement might also be a motive for trading partners to search for other private enforcement mechanisms (Milgrom, North & Weingast, 1991; Greif, 2005). Furthermore, Gabre-Madhin (1999) and Maze (2005) contended the importance of private institutions in the efficient organization of economic exchanges and for the functioning of markets by improving contractual performances and reducing transaction costs. The study by Gabre-Madhin (2001) on the role of market intermediaries in Ethiopian grain market found that the brokerage institution enhances marketing efficiency by reducing the search cost for traders. In addition, Gabre-Madhin (1999) found evidence where brokers are being contacted to mediate and resolve disputes between grain traders in Ethiopia.

4.3   Perishable commodity marketing

Agricultural marketing plays an important role not only in stimulating production and consumption but also in accelerating the pace of economic development (Khols & Uhl, 1998). It leads to the optimization of resource use and output management, increase in farm income, growth of agro-based industries, adoption and spread of new technologies, better living, and creation of utility. An increase in the efficiency of the marketing process,

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which results in lower cost of distribution and lower prices to consumers, might bring about an increase in the national income. An efficient marketing system may contribute to an increase in the marketable surplus by scaling down the losses arising out of the inefficient processing, storage, and transportation. It guarantees the farmers better prices for their products and induces them to invest their surpluses in the purchase of modern inputs so that productivity may increase (Khols & Uhl, 1998).

4.3.1 Marketing margin

Marketing margin or price spread is a commonly used measure of the performance of a marketing system (Abbott & Makeham, 1990). It can be a useful descriptive statistics if used to show how the consumers' expenditure is divided among market participants at different levels of the marketing systems. It is defined as the difference between the price the consumer pays and the price that is obtained by producers, or as the price of a collection of marketing services, which is the outcome of the demand for and supply of such services. A large number of studies have analyzed the marketing margins for different types of commodities to examine the performance of agricultural products marketing (e.g., Wohlengenant & Mullen, 1987; Schroeter & Azzam, 1991; Holt, 1993). Sexton, Zhang & Chalfant (2005) argued that even though variations in the margin over time might be attributable to marginal marketing costs under perfect competition, additional factors such as seasonality, technological changes, and sales volume may also explain the variations in the margin. In analyzing factors explaining variations in the margin, some authors used the observed margin as a dependent variable (e.g., Brorsen et al., 1985; Wohlengenant & Mullen, 1987; Schroeter & Azzam, 1991) while others used the expected margin (e.g., Holt, 1993) as a dependent variable criticizing the former for not taking expectations with respect to both the mean and variance of the output price. The explanatory variables used to explain the variations in the margin may include marketing costs, total volume traded, time trend, seasonality, lagged margin, etc.

4.3.2 Market Power

In economics, market power is the ability of a firm to alter the market price of a good or service. It is the ability to raise prices without losing customers to competitors. In perfectly competitive markets, market participants have no market power. A firm with market power has the ability to individually

affect either the total quantity or the prevailing price in the market or both. It is a common experience in marketing studies to use the perfectly competitive markets as a benchmark for assessing the degree of firm's market power in buying or selling a commodity. In a competitive market, price equals marginal cost for each firm in the market. Thus, researchers typically try to measure the gap between the price and marginal cost when estimating the degree of market power. In industries where sellers have market power, firms charge consumer prices above marginal cost, while market power in buying is the ability to set prices paid to suppliers below marginal cost. Exercise of either oligopoly or oligopsony power by intermediaries is harmful to producers because both forms of market power reduce sales of the farm commodity through the intermediate channels (Sexton & Zhang, 2001). Oligopoly power at retail/wholesale results in price set above the competitive level, which may reduce sales and divert the product to alternate market outlets. Oligopsony power in procurement reduces prices to producers below the level that would prevail under perfect competition.

Evidence on food industry market structure suggests that many food product markets are not perfectly competitive (Connor et al., 1985; Sexton & Zhang, 2001). For perishable commodities, the imperfection is more apparent as intermediaries have the opportunity to exploit the inelastic nature of short-run supply to mark-up prices in excess of marginal cost (Sexton, Zhang & Chalfant, 2005).

Until the early nineties, empirical analysis of imperfect competition in the marketing of perishable commodities was based on the traditional elastic supply assumptions and on the price linkages among marketing chains and across regions, and provide no structural models of price determination. However, the seminal work of Sexton & Zhang (1996) offered a structural model of short-run price determination which accounts for the inelastic nature of short-run supply of perishable commodity marketing. Sexton & Zhang (1996) modeled farm price determination in a switching regression framework in which price is determined based on the harvest costs or at the value above the harvest costs depending upon the relative bargaining power of buyers and sellers.

4.3.3   Output price risk

In commodity marketing, firms usually make commodity purchase decisions without knowing the future selling price. That means, firms bear output

price risk in the trade and economic theory predicts compensation for it. The impact of output price risk on the marketing margin of agricultural products has been recognized by many researchers (Holt, 1993). By using a variant of Sandmo's model of the firm under output uncertainty, Brorsen et al. (1985) show that marketing margins are affected by output (demand) price risk. Their model has been extended by Schroeter & Azzam (1991) to capture the non-competitive behavior of the marketing firms although they did not estimate the GARCH process simultaneously with their model of structural equations, leaving the process generating the output price variability exogenous (Holt, 1993). A large number of marketing studies attributed a marketing margin in excess of the marketing costs as a reward for buyers' risk bearing (Haung, Sexton & Xia, 2006). In the estimation of the risk effects, econometric techniques such as the fixed–weight moving averages (e.g., Brorsen et al., 1985) and the generalized conditional hetroscedasticity (GARCH) (e.g., Schroeter & Azzam, 1991, Holt, 1993, Haung, Sexton & Xia, 2006) were used.

A recent study by Haung, Sexton & Xia (2006) takes into account both the impact of market power and the output price risk in farm price determination arguing that the exclusion of one of the factors from the model might lead to an omitted variable bias.

5 Methodological Approaches and Data

5.1 Modeling procedures

In order to fulfill the objectives in section 3, various economic and econometric techniques were employed.

5.1.1 Models of efficiency estimation and its determinants (Articles I & II)

In Article I, the non–parametric data envelopment analysis (DEA) was used to estimate technical, allocative, and economic efficiencies of the mixed crop farming systems. Because of the bounded nature of efficiency estimates between zero and one and the existence of large number of farmers with efficiency scores of one, we employed Tobit regressions to identify sources of efficiency differentials among mixed crop farmers. In Article II, both DEA and SFA are used to estimate technical, allocative, and economic efficiencies of vegetable production. The parametric stochastic frontier method was also used to examine whether efficiency estimates are affected by external shocks, which the DEA model does not capture. Because of the strong positive correlations between the efficiency scores obtained from the two methods, Tobit regressions on DEA scores were used to identify the sources of efficiency differentials among vegetable farmers. Moreover, since DEA attributes all deviations from the frontier to inefficiency, it is argued that it may be sensitive to outliers and measurement errors. To test for the robustness of the DEA model to input outliers and measurement errors, we employed, among others, the method by Retsi (1997) which tests for the significance of the correlation between efficiency scores obtained from the original sample with that obtained from a sample where all efficient farmers are excluded. High positive correlation between the efficiency scores

obtained from the two samples is an indication of the robustness of the method.

5.1.2 Theoretical model of contract enforcement (Article III)

The general conceptual framework of contract enforcement largely developed by Fafchamps (2004) was extended to incorporate risky transactions (sales involving late, partial and non–payment) to analyze contract enforcement in the study areas. The analysis begins with the promised payment date and moves back to the time of delivery (Back–ward induction). By taking into account the punishments the trader receives for breaching the contract and the cost of honoring it; the model determines a set of conditions under which a rational trader honors the contract. This is followed by setting forth the conditions under which a rational farmer, whose beliefs are given by the joint cumulative distribution $J(\mu,\nu|\Omega)$ and delivers q units of vegetables at date 1, actually agrees to a contract. This requires his expected profit from contract sales to exceed the expected profit from sales in the alternative use. Finally, it sets the conditions under which a rational trader of known type honors the contract at the time of delivery, given his expected profit from receiving q units of vegetables. This also requires the expected cost of honoring the contract and the expected cost of punishments to be lower than the expected profit from receiving q units of vegetables. By combining the two latter conditions, a number of predictions that can serve as a basis for the empirical analyses are derived. Finally, binomial and pooled multinomial Logit regressions were employed to analyze the determinants of contract enforceability through brokers and contract non–compliance by traders.

5.1.3 A model of farm price determination (Article IV)

The perishable commodity pricing model developed by Sexton & Zhang (1996) which accounts for market power component only, while it overcomes many weaknesses of the conventional method of perishable commodity pricing rules, it does not allow for the test of the impact of output price risk in farm price determination. Given the bulk of empirical studies which have found a statistically significant impact of output price risk in produce pricing strategy, the exclusion of the risk term from the produce pricing equation leads to omitted variable bias (Haung, Sexton & Xia, 2006).

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In the model, it is assumed that traders do not know the selling price at the time of purchase and exert market power in buying vegetables from farmers. With these assumptions, the profit function of the representative trader is expressed as a function of the mean and standard deviations of the trader's profit. In this case, the output price appears to be the only source of risk and it affects the profit function linearly. According to Bar-Shira & Finkelshtain (1999), the risk preferences of the trader can then be represented by a utility function which is an increasing function in the mean and a decreasing function in standard deviation of the trader's profit. The first order conditions of the trader's utility maximization subject to the quantity supplied yields farm prices as a function of the expected wholesale prices, the per–unit marketing costs, the degree of market power and the marginal risk premium that a trader losses or gains because of his risk preferences. In Article IV, the model of farm price determination by Haung, Sexton & Xia (2006) which accounts for market power and risk preferences of the traders is used to determine the farm price for four vegetables, namely, potato, onion, tomato and cabbage.

5.2   Description of the study areas

The study areas covered two producing zones of Oromia regional states and three main cities in Ethiopia. The producing zones, East Hararghie and East Shoa zones are located in the eastern and central parts of Oromia regional state of Ethiopia. Their total areas are respectively 62220 and 73657 square kilometers. According to CSA (2005), their populations are respectively 2555635 and 2475945. Mid-altitude and lowland agro-climatic zones of altitude ranging from about 1600-2100 masl characterize them. All zones receive an annual average rainfall of about 400-1600 mm. Population densities are 103 and 182 persons per square kilometers (CSA, 2005). East Hararghie zone comprises 23 districts of which 60% are mid–altitude and 40% are lowlands. East Shoa zone comprises 32 districts of which 67% are mid altitudes and 33% are lowlands.

The major agricultural products in the areas are crops (e.g., vegetables, sorghum, millet, maize, *teff, and t'chat*), livestock (e.g., cattle, goat, and sheep), equine (donkey, mule, horse) and poultry. The most commonly produced vegetables include potato, sweet potato, carrot, lettuce, cabbage, onion, shallot, garlic, tomato, cauliflower, peppers, and beetroot. The production of vegetables and *t'chat* during the dry season is supported by

irrigation from the nearby lakes, rivers, and wells using diesel pumps and small canals.

These zones are among the surplus producing parts of the country and they supply a considerable volume of vegetables to other parts of the country and for the export markets. They have relatively better marketing networks due to their proximity to better roads and irrigation sources. Especially, in eastern Shoa there are a number of lakes that can irrigate around 50,000 hectares of the 3.5 million hectares of irrigable land potential of the country (Rahmato, 1999). In these areas, the development of small–scale irrigation schemes with the aim of producing high value crops might help to reduce the impacts of erratic rainfall and the use of land for multiple harvests. Even though such regional comparative advantages exist, households' resource use in the production of high value crops is minimal (CSA, 2002).

In the study areas, high quality vegetables are sold to the wholesalers in the nearby small towns directly or through middlemen. The wholesalers sell, in turn, to the retailers and/or exporters centered in the main cities. The three main cities, namely Addis Ababa, Adama and Dire Dawa are included in the survey for marketing analysis as they are major consuming cities and distribution centers to export markets. Their populations are respectively 3000000, 228623, and 398000 (CSA, 2005). Adama is located in the eastern Shoa zone at an approximately 100km southeast of Addis Ababa. Dire Dawa is located in the eastern part of the country at an approximately 500km from Addis Ababa. It is the second largest city in Ethiopia.

Figure 3. Map showing the study areas

5.3   Sample selection and data collection procedures

Data for the analysis of the efficiency of mixed crop and market-driven (vegetables) farming systems was obtained from 150 vegetable farmers in two districts of eastern Ethiopia (Haramaya and Kombolcha) selected by two stage purposive and random sampling methods (Scott & Smith, 1975; Colff, 2003). A semi-structured questionnaire was designed to gather information on production, consumption, socio-economic and institutional constraints, and conservation decisions of the households.

For the marketing contract analysis, primary data on contract formation and enforcement, and its associated problems were obtained from 90 vegetable farmers, 50 traders, and 30 brokers selected from two zones of Oromia regional state of Ethiopia, namely East Hararghie and East Shoa by

two stage purposive and random sampling techniques (Scott & Smith, 1975; Colff, 2003).

For the analysis of traders produce pricing behaviour, time series data on prices at different levels of the marketing chain, total production, marketing costs, and transaction costs for vegetables were collected. Unfortunately, in most African countries, time series data on the aforementioned variables is scarce or non-existent especially for such types of agricultural products. Hence, time series primary data on the volume marketed to three main cities, the transportation cost from the producing districts to the consuming cities, loading and unloading costs, sorting and packing costs, market fees and prices at different levels of the marketing chain were collected on weekly basis for one year on four vegetables, namely potato, onion, tomato, and cabbage.

6   Results of the Study

This study address both theoretical and empirical issues pertaining to farm households' resource use efficiency in Ethiopia operating in imperfect markets and institutional settings. Using parametric and non-parametric techniques, an extended general conceptual framework of contract enforcement, and a structural model of procurement, the most important parameters of farm productivity and marketing performance of vegetables in Ethiopia are estimated. Its main focus is on identifying factors affecting vegetables farm productivity and market performance to supplement knowledge for government's policy formation process that is committed to shift farmers from semi-subsistence to market-oriented production.

6.1   Efficiency of mixed-crop farming (Article I)

Due to high population pressure and environmental as well as marketing risks, agricultural production in Ethiopia is dominated by mixed-crop farming systems. Accordingly, this study begins with the estimation and identification of the determinants of efficiency of vegetable-dominated mixed farming system in two districts of eastern Ethiopia known for vegetation production. The non-parametric data envelopment analysis (DEA) and Tobit regressions were used to estimate technical, allocative, and economic efficiencies of vegetable-dominated mixed crop farmers and identify factors explaining efficiency differentials among farmers.

The mean technical, allocative, and economic efficiency estimates obtained from the DEA models are 0.91, 0.60, and 0.56 respectively indicating that farmers have attained a relatively high level of technical efficiency but lower allocative and economic efficiencies. These results

indicate the existence of a considerable potential to increase agricultural output without using additional inputs, given the existing technology. The result also indicates that if these farmers operate at full efficiency levels, they could, on average, reduce their costs of production by 44% and still produce the same level of output.

The analysis of the determinants of efficiency of vegetable-dominated mixed farming system using a Tobit model indicate that asset, off/non-farm income, farm size, extension visits, and family size are the statistically significant factors affecting technical efficiency of the farmers. Asset, crop diversification, consumption expenditures, and farm size significantly affect allocative and economic efficiencies. The significant negative impact of crop diversification on allocative and economic efficiencies might be related to the fact that diversification causes additional managerial complexity more than it facilitates risk management. The negative effect of extension visits on technical efficiency, although somewhat unexpected, is justifiable given the limited training extension officers receive, the utmost attention they devote to the market-driven farm production and their involvement in many non-extension activities such as credit applications processing, input distributions, and collection of loans and taxes. Consumption expenditures are found to have a significant negative impact on allocative and economic efficiencies. A plausible explanation is that excessive spending on consumption goods curtails farm households' demand for factor inputs that enhance farm productivity. Other factors that are found to affect the efficiency of the mixed-crop production system are asset ownership, family size and off/non-farm income. Farmers that are cash and liquidity constrained are less efficient compared to their unconstrained counterparts maybe because of the inadequate credit facilities. Moreover, farmers with a large family are also less efficient probably because they have not been utilizing their labor resources efficiently.

6.2   Efficiency of vegetable production (Article II)

Economic policies that are geared towards the diversification of export trade by shifting farmers' production practices from semi-subsistence to market-driven production require empirical evidence on which factors affect the performance of the market-driven production system. In Article II, technical, allocative, and economic efficiencies of vegetable production are estimated and factors affecting these levels are identified. Both SFA and

DEA methods are used for estimating efficiency scores. Comparisons between the semi-subsistence and market-driven production performances, and the two estimation methods are also conducted. Lower technical efficiency (0.66) and economic efficiency (0.43), but higher allocative efficiency (0.64) indices are obtained for the market-driven farm production. Given imperfect credit markets, household's wealth (physical asset) is found to be highly correlated with all efficiency measures. High consumption expenditures and large family size impede vegetable farm productivity whereas institutional arrangements such as extension and credit services enhance it. Results based on the comparison of the performances of the two production systems indicate that the semi-subsistence production performs better than the market-driven production. The study also shows that lower efficiency estimates for the market-driven production system are attributable to the limited access to capital markets, high consumer spending, and large family size.

6.3 The enforcement of vegetables marketing contracts (Article III)

In this article, the general conceptual framework of contract enforcement largely developed by Fafchamps (2004) is extended to accommodate for a 'payment at risk' to draw basic contractual premises that can be tested through empirical data and econometric models. Empirical data and econometric results support model predictions. Trust and brokers' mediation are found to augment grower-trader contract enforcement. Survey results show that legal means, reputation, harassment, clanship, ethnicity, and collective boycott are not widely used mechanisms of enforcing contracts. Contract breaches by the parties are common. Flexibility, screening, negotiations, and brokers' mediation were among the most commonly used means of handling disputes and sustaining contracts. Econometric tests on which factors influence contract enforceability through brokers and contract breaches by traders are also conducted to supplement model predictions and survey results. Results show that age, information access, whether the buyer is a trader, and trader-specific investments enhance contract enforceability through brokers. Dependency on the trader, duration of the relationship, transaction frequency, and market distance reduce the likelihood of contract enforceability through brokers. Traders' failures to honor the contract are mainly due to perishability, seasonal excess supply, illiteracy, and client-buyer's type.

6.4 Vegetables pricing strategy of traders (Article IV)

In this article, we investigate the impact of market imperfections and risk preferences upon farm price determination. Controlling for farm characteristics and other factors, we find that farm prices significantly and negatively depend on traders' market power and risk seeking behavior. We also find outcomes such as harvest volume, shipping cost, and time trend to be significant factors explaining variations in the price spreads. The decomposition of traders share of the marketing surplus into market power and risk components indicate that traders' share of the marketing surplus due to risk taking behavior is substantial. Their utmost audacity to risk, although somewhat unexpected, might be related to their wealth status and the imperfect contract enforcement prevalent in the study areas. Moreover, results show that traders share of the marketing surplus increases with the degree of perishability of the produce. That is, the more perishable the produce is, the higher is the share that traders' capture from the marketing surplus.

7 Conclusions and Policy Issues

In recent years, the government of Ethiopia has embarked upon new development strategies that put emphasis on moving farmers from a semi-subsistence to market-oriented farming systems. This policy intends to enhance farm productivity and marketing efficiency of high value crops as one of its main objectives. Consequently, quantifying farm productivity and surplus share of market participants, and identifying their determinants are of importance for providing sound policy advice. This study adds information to the existing empirical literature on performance evaluations by analyzing farm productivity and marketing performance of vegetables in a semi-subsistence economy given output price risk and uncertainty. The study reveals poor production, contract and marketing performances for these crops. Improvements in farm-level efficiency rely on institutional capacity building that enhances asset ownership, extension and credit services, consumption and family planning know-how, and crop as well as income diversification. This implies that policy makers need to focus on providing institutional support to farmers rather than focusing on introducing new technologies, which if the necessary technical and managerial skills are not in place may result in continued inefficiencies in production.

The impact of contract performance upon economic growth seems unrecognized by the policy makers in many developing countries. Formal institutions involvement in enforcing contracts is minimal. Societal and cultural norms that support trust building have been fading. However, as argued by many studies on contracts (e.g. Woodruff, 2002; Fafchamps, 2004; James, 2005) trust among parties has a significant impact in facilitating exchange, providing higher quality of goods, and lower the costs of governance by reducing the need for expensive contracting, enforcement, or litigation. Contract performance improvement demands contract

innovations and adequate information systems. It also requires the development of institutions that may facilitate the enforcement of contracts, and provide financial and managerial support to the contracting parties. The study results indicate that even though contracts perform poorly, its enforcement is mainly due to mutual trust and brokers' mediation. The significant share of the marketing surplus that traders receive from the sales of vegetables might be related to the absence of strong public and private institutions that facilitate the enforcement of contracts. This fact tends to decrease farmers' incentive to produce the market-driven goods thereby reducing the overall output level as well as the export earnings from this sector. The brokerage institutions need to be strengthened since this would reduce the cost of enforcing contracts and the problems associated with asymmetric information.

The results of the analysis of produce pricing efficiency of vegetables actually show that traders capture a major proportion of the marketing surplus due to market power and the audacity to absorb output price risk. It is also shown that traders' share is higher for the most perishable vegetables than others. Marketing margins widen as supply increases, supporting the argument that large volume of shipment of perishable commodity reduces farm prices. The substantial share of marketing surplus allocated to traders due to the absorption of risk might be related to the less severe punishments traders receive for breaching contracts. The building of societal norms, cooperatives, strong public and/or private institutions, adequate marketing and information networks are consequently needed to improve the marketing performance of vegetables in Ethiopia.

8 Contributions of the Study

The contributions of this thesis are largely empirical. The first article analyses farm-level production efficiency of mixed crop farmers who produce vegetables to satisfy their cash demands. The second article focuses on analyzing farm productivity of vegetables. The main objective of the first two articles is to provide supportive evidence to government's policy that aims at moving farmers from semi-subsistence farming to cash crop production. They are related and interlinked. Policy measures that aim at moving farmers from semi-subsistence to cash crop production need to identify socio-economic factors that affect the performance of the two production systems. The study is unique in providing detailed empirical analysis of the performance of the semi-subsistence and cash crop production, and on which economic factors to focus to make a smooth transition from the former to the latter production system.

Another important issue analysed in both articles is a test of the common hypothesis in developing countries agriculture that 'crop diversification serves as a hedge against production and marketing risks' (Robert, 1980; Helmers, Yamoah & Varvel, 2001). There is no detailed empirical works that provide support to this hypothesis. In this analysis, the managerial complexity that diversification could induce need to be realized. To analyze the impact that diversification may have on the production performance of the two production systems, we take two major steps. First, we included the number of crops and vegetables grown as one of the explanatory variables in the Tobit model. Second, to analyze the managerial aspect of diversification, we categorized vegetables into 'the less managerially demanding' and 'the more managerially demanding' based on farmers' response to different farm management practices, and compared the performances of the two groups. Our results show that diversification outweighs the managerial complexity that it induces for the market-driven production whereas the reverse is true for the

semi-subsistence farming. Results from the study contribute to the literature on productivity analysis in that the impact of crop diversification on farm productivity varies with the production system and the motives behind it. Diversification could bring forward the expected efficiency gains if and only if the managerial competence of the farmer has been upgraded through suitable institutional arrangements that integrate modern farming practices with the indigenous knowledge of the farmer.

The contribution of the first two articles to the literature on productivity studies may be summarized as follows. First, they estimate and identify the determinants of the whole farm and enterprise level production efficiency in a developing country's agriculture. Second, they augment the common findings that parametric and non-parametric efficiency estimation methods are comparable. Third, they compare whole farm and an enterprise level efficiency in production and factors influencing them. Fourth, they analyze the impact that crop diversification could have on productive performances by taking into account the managerial complexity it induces. Fifth, they show that the theoretical argument that extension contacts improve farm productivity is not generally true unless proper focus and knowledge are in place. Sixth, they signal to policy makers the existence of a substantial potential to improve farm productivity without further investment in new technologies.

The third article makes several contributions to the literature on relational contracts. First, it extends the general conceptual framework of contract enforcement largely developed by Fafchamps (2004) to account for risky transactions. Second, there are only a handful of studies that examine relational contract farming in developing countries and none for perishable commodities. Some of these studies have examined the welfare effect of contract farming (Minten, Randrianarison & Swinnen, 2007), the effect of monitoring of the growers by the processor (Bellemare, 2006), how contracting overcomes market failures (Grosh, 1994) and how contract farming explores the causes of observed variations in the scale of outgrower production (Key & Runsten, 1999). Third, it addresses the role of brokers in forming and enforcing contracts between growers and traders. Fourth, it provides an empirical test of moral hazard (non-compliance to contractual obligations, loosely speaking) on part of traders which the applied contract-theoretical literature on contract farming has commonly ignored. Fifth, the policy implications of the findings are quite relevant for local policy initiatives. The findings that market information, contract duration, frequency of transaction, whether the buyer is a trader, trader-specific investment jointly

influence contract enforceability through brokers all point to the importance of information upon the enforceability of contracts through brokers.

The fourth article's contributions to the literature on fresh produce marketing are generally empirical. First, by incorporating the market power and risk effects into a farm price determination model, it identifies the implicit losses to producers in the presence of market power and risk factors. Secondly, the study also examines whether the degree of market power and risk effects vary along with the degree of perishability of the produce and across markets. Third, the results reveal that traders in developing countries may capture a substantial proportion of the marketing surplus not only due to market power, but also for their utmost audacity to absorb risk.

9 Suggestions for Future Research

Based on the results from this study, some suggestions for future research can be inferred. First, due to lack of separate data for measuring the performance of producers who market their products on contractual basis and those who do not, we have not been able to compare the production performances of the two groups. Hence, further research is required to supplement the general hypothesis that contract farming improves efficiency in production by mitigating the adversities that arise due to market failure conditions. Second, whether farmers' risk preferences affect production, contract, and marketing performances are issues subject to debate in economics. By collecting relevant data on risk preferences of farmers, the analysis of production, contract, and marketing performance improvements associated with different risk preference scenarios may be important. The issue is relevant since in Article IV traders are found to capture a substantial share of the marketing surplus for bearing output price risk in the trade. Hence, an analysis of the extent to which farmers' share of the marketing surplus depends on their risk preferences might help to provide knowledge to improve the performance of markets. This is important since the significant share of the marketing surplus that traders receive might not only be explained by traders being risk seekers, but may be because farmers are extremely risk averse.

Third, the issue of whether improvements in production and marketing performances may be attained by introducing small scale processing/procurement industries that add value to vegetables is of importance given the perishable nature of the produce and the long distance trade in a situation with less developed infrastructure. Fourth, the analysis of spatial efficiency of vegetables is of importance to examine whether there are resource misallocations in shipping vegetables from surplus producing

regions to vegetable-deficit regions. Finally, a partial equilibrium analysis of the effects of recent market policies on the spatial efficiency of high value crops with export potentials might be useful to evaluate the prospective social gains attributable to policies geared towards improving market performances.

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