COMMERCIALISATION OF ETHIOPIAN AGRICULTURE

Proceedings of the 8th Annual Conference of the Agricultural Economics Society of Ethiopia

Edited by:

Edilegnaw Wale
Demissie G/Michael
Bezabih Emana
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Agricultural Economics Society of Ethiopia

Addis Ababa
April 2006
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The Agricultural Economics Society of Ethiopia (AESE) is a non-profit making professional society established in 1995. The objectives of AESE are to contribute to the development of Ethiopian agriculture by promoting research and development in agricultural economics, to promote the study of agricultural economics in the country’s educational institutions, to promote agricultural research and assist in the dissemination of results, to provide for the discussion of problems of agricultural development, to promote the professionalism of agricultural economists and to enhance contacts among agricultural economists and other related professional in Ethiopia and abroad.

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Foreword

Deep-rooted and complex problems of poverty, food insecurity, and degradation of land and natural resources have been the ever-increasing challenges of the Ethiopian economy. The recent drought and the ensuing food shortage in many parts of the country have raised serious questions among many researchers, planners and development practitioners regarding what needs to be done to reverse the current situation and to bring about sustainable development of the rural economy. One of the lessons learned from the new institutional economics is that agricultural development is not all about production and productivity. It is also a question of market development and crafting of working institutions to enable effective agricultural-industrial growth linkages and to address the complex and interlinked problems of poverty.

The poor performance of the Ethiopian economy, particularly the agriculture sector, is mainly attributed to supply and demand side constraints. These constraints have been accumulated over the years and, hence, call for an urgent configuration of the economy, careful strategic planning and implementation and long years of commitment on the part of concerned individuals, local community, the state, and international donor community.

Commercialisation of agricultural production might be one of the solutions to the stated constraints. As a result of rapid growth of the population, there is a general tendency of diminishing farm size, making smallholder farmers unable to produce sufficient food following the traditional portfolio selection. Thus, the necessity of alternative mechanisms of agricultural production, that would enable farmers to benefit from market integration, is attracting the attention of policy makers and development practitioners.

Farmers are losers not only during bad harvest seasons but also during good ones. During bad seasons, they automatically lose their entitlement to food and during good seasons their harvests lose value because of drastic fall in prices. That is why the majority of Ethiopian smallholders are food insecure not
only during shortfall of food production but also during bumper harvests. In both scenarios, farmers’ resources are used for immediate household consumption as they are unable to produce or buy enough food. This results in recurrent resource depletion. To reverse the recurrent vicious cycle of food insecurity and to free farmers from the grip of subsistent peasant agriculture, policy makers have to urgently address supply and demand side constraints.

Since the beginning of the 1990’s, the Ethiopian government has embarked on a variety of development policies and strategies. At the heart of the country’s economic policy lies a development strategy, commonly known as ‘Agricultural Development-Led Industrialization (ADLI)’. Commercialisation of smallholder agriculture, which effectively links farmers to markets, is one of the ingredients of ADLI. Hoping to make this strategy successful, the government has been heavily investing on infrastructure, agricultural extension programmes, rural finance, research and development, technology transfer and information, education, and resettlement programmes. In addition, the donor community (local and international) and the private sector are investing resources to reverse the status quo. All these developments and the contextual attributes of smallholders create their own challenges and opportunities for commercialisation of smallholder agriculture in the country. These challenges and opportunities require careful research, among others, by agricultural economists.

In this vein, there is a great need to examine the challenges and opportunities facing commercialisation of Ethiopian smallholder agriculture in view of degrading natural resources, land fragmentation, population growth, and deep-rooted rural poverty in the country. Consequently, the Agricultural Economics Society of Ethiopia has found it timely to document the results obtained from agricultural economics research so as to help policy makers in facilitating commercialisation of agriculture, identifying the sectors or commodities that need to be given priority in the short term and medium to long terms, and harnessing the synergies of market development with development interventions.
Thus, the Society organized its 8th Annual Conference with the theme 'Commercialisation of Ethiopian Agriculture'. The conference has gathered policy makers, development practitioners, researchers, and academicians. This volume contains the edited versions of selected papers presented at the conference.

The Executive Committee of the Agricultural Economics Society of Ethiopia appreciates and thanks all institutions and individuals who supported the organisation in the realisation of the conference. Special thanks go to the Ethiopian Agricultural Research Institute and Adama Mekonnen Hotel for sponsoring the conference.

The Editors
Opening Speech Made By His Excellency Ato Getachew Teklemedhin,  
Minister of State, Ministry of Agriculture,  
At the 8th Annual Conference of AESE (February 24-26, 2005)

Distinguished Conference Participants, Ladies and Gentlemen,

It is with great pleasure that I am giving an opening speech at the 8th Annual Conference of the Agricultural Economics Society of Ethiopia. The theme of the 8th Annual Conference, ‘Commercialisation of Ethiopian Agriculture’, is in line with the agricultural development strategy of the Government and is very timely. The selected theme has significance not only for the agricultural and rural development efforts underway, but also for the overall development of the country and its integration to the world economy. The Agricultural Economics Society of Ethiopia, as one of the professional societies in Ethiopia and a stakeholder in the development of the country, has been making concerted and unprecedented efforts by bringing together the different stakeholders for discussing and designing alternatives to development challenges and bottlenecks to Ethiopian agriculture and the economy at large.

Ethiopia has ample unutilized natural and human resources and these make it favourable for both agricultural and industrial development. In today’s global economy, the geographic location of Ethiopia is a comparative advantage to trade in most directions. The seizure of the opportunities/potentialities is the key for sustainable agricultural growth and economic development.

Ethiopia’s agricultural growth and development challenges are many, multifaceted and interwoven. Since Ethiopia’s agriculture is mainly dependent on rain and natural calamities occur recurrently, the economy could not easily be resilient. Moreover, structural rigidities slow down agricultural growth and development of the country. As a result, the country’s economy does not seem to have gone very far in terms of bringing about sustained growth and structural shift, and well integration into the world economy. To date, in
Ethiopia, poverty, food insecurity and living standard (In per capita income, Ethiopia ranked 202nd from 207 countries) have worsened in the face of increasing population pressure, degradation of land and natural resources.

Cognizant of this fact, the Government of the Federal Democratic Republic of Ethiopia has been implementing policies, programmes and strategies to achieve rapid socio-economic development based on Agricultural Development-Led Industrialization development strategy (ADLI). The ADLI development strategy is believed to be most effective in reducing poverty, improving welfare and accelerating the development of the national economy. One of the core components of the ADLI development strategy is the commercialisation of Ethiopian agriculture.

Dear Conference Participants, Ladies and Gentlemen,

In a country like Ethiopia, where poverty is mainly concentrated in the rural areas and agriculture is the mainstay of the economy, agricultural and rural development is the quickest way of reducing not only rural poverty but also urban poverty. The Ethiopian Government, including the private and donor communities, have been investing more and more on infrastructure, support services such as extension, rural finance, technology and information, market development, education, civil service reforms and resettlement programmes to reverse the disappointing problems facing the people of Ethiopia.

For instance, with the objective of implementing Food Security Strategy, a special programme has been put in place and this programme focuses on solving the problem of chronically food insecure sector of the society, which ranges from 6-7 million every year. Bridging the gap between humanitarian aid and development is critically important under this scheme. Parallel to the aforementioned and various agricultural development programmes which have been implemented throughout the country, the Government of FDRE is also implementing different market development programmes and strategies, which are believed to assist the agricultural commercialisation process. In this regard, the development of warehouse receipts system, interim market
information system, export promotion strategy and the institutional export development programme, and several bilateral trade agreements and investment treaties are some of the efforts being made to improve domestic and international markets of the country.

In the livestock sub-sector, markets are being strengthened and developed for live and slaughtered animals and animal products and new export markets are being explored. Likewise, the market and investment for floriculture, horticulture, coffee and other high value crop sectors are being developed rigorously.

Although commendable efforts have been made towards realizing the envisaged objectives, much has to be done yet and several complex issues still remain to be resolved regarding ways and extent of the commercialisation of Ethiopian agriculture to bring about economic development. This is to emphasize that commercialisation of agriculture is a complex process and demands a careful planning and commitment on the part of the people, research and development actors, policy makers and the international community.

Hence, it is high time that we investigate ways of breaking the vicious circle of poverty and food insecurity, and also the challenges and opportunities of commercialisation of Ethiopian agriculture. In effect, it is possible to design policy and institutional options that could alleviate the recurrent poverty and food insecurity problems of the people and improve the commercialisation of Ethiopian agriculture and the development of the overall economy.

Conference Participants, Ladies and Gentlemen,

I have learnt from the programme of the 8th Annual Conference that this forum will deliberate on policy and strategic issues that are pertinent to commercialisation of Ethiopian agriculture and sustainable rural and agricultural development of the country. To this end, key features of institutional innovations and policies, programmes and strategies for
commercialisation of Ethiopian agriculture will be discussed. Moreover, the conference will deliberate on issues of domestic and international competitiveness through the adoption of international quality management principles and practices.

Furthermore, the conference is expected to deliberate on pertinent issues of urban agriculture, rural-urban linkages, financial and insurance institutions, input and commodity marketing, transfer of appropriate agricultural technologies and natural resources management for commercialisation of Ethiopian agriculture and integration to the world economy. In this respect, the recommendations that could come out of these important deliberations can be useful inputs for the efforts underway to bring sustainable market-led agricultural development in our country.

On this occasion, I would like to thank the executive committee of the Agricultural Economics Society of Ethiopia for their efforts in organizing this timely and pertinent conference. My gratitude also extends to the sponsors of this conference, namely Ethiopian Agricultural Research Organization, and individuals who pledged to financially support the conference.

Wishing you successful deliberations, I declare this workshop officially open.

Thank you!
PART I

INTRODUCTION
INTRODUCTION

The Proceedings comprise of five parts. Part I introduces the topics covered under each part. It provides the highlights of the coverage of the papers presented under the respective topics. The aim of this introductory chapter is to guide readers through the topics covered in the proceedings.

Part II deals with policies for commercialisation of smallholder agriculture in Ethiopia. It incorporates two papers. The first paper deals with policies related to commercial transformation of Ethiopian agriculture. It briefly presents the history of agriculture policies of successive governments in Ethiopia. A more elaborated discussion on the EPRDF’s two-pronged approaches for commercialisation of agriculture in Ethiopia, namely the modernisation of smallholder farms through the provision of improved technologies and inputs via extension and credit services, and the efforts exerted to make peasant production more market-oriented through the re-establishment of farmers’ co-operatives have also been included. The policy aims at providing support to private investors who venture in the establishment of large commercial farms in less populated lowland areas without displacing settled population. Finally, the paper identifies areas of possible policy intervention, which would enable smallholders exploit the benefits obtained from commercialisation.

As a sequel to policy review, the second paper presented in Part II has made a comparison of the advantages/disadvantages of domestic production and importation of durum wheat. The paper shows that domestic production provides more advantages in terms of social and private profitability, employment and saving of foreign currency.

Part III deals with agricultural technologies and commercialisation of smallholder agriculture in Ethiopia. Part III consists of three papers. The first paper deals with the spread of sweet potato production technology in Southern Ethiopia and fertilizer adoption in cereal producing areas. The paper concludes that adopting improved varieties of sweet potatoes increases income, consumption and marketable products.

The second paper deals with informal channels for transfer and adoption of improved sweet potatoes technologies in Southern Ethiopia. The study investigates alternative channels for the transfer of sweet potato varieties and attributes of those varieties
that promote transfer and adoption rate. Moreover, the paper shows that technology transfer through informal sectors is faster and it can cover wider area in a short span of time.

The third paper analyzes the determinants of fertilizer adoption in the major cereal-producing areas of Ethiopia. The study identifies key factors influencing adoption and intensity of fertilizer use. These factors include access to extension services, input credit, hired labour, availability of improved seeds and regional differentials. Implications of the study are the need for strengthening extension services, developing human capital and improving farmers' access to financial resources, which are important areas of priority for the success of future intervention strategies and commercialisation.

In Part IV, topics related to rural institutions and commercialisation of smallholder agriculture in Ethiopia are entertained. There are two articles in this part. One is dealing with rural livelihood and participation in extension programme and the other is dealing with the role of informal finance in rural economy. The first paper underlines the fact that marginalizing the poor rural households from the extension programme aggravates rural livelihood insecurity and rural poverty. Furthermore, the paper points out the importance of considering a paradigm shift from production-oriented agricultural extension to livelihood extension approach, which comprises of agricultural and non-agricultural rural interventions.

The second paper discusses different sources of informal finance in the rural areas and their advantages, including flexibility, adaptability, and ease of operation supported by the social and traditional ties in the society. It shows that informal credit has huge contributions to rural economy by increasing rural households' access to improved technologies and diversification of income generating activities.

Part V deals with natural resources management and commercialisation of smallholder agriculture in Ethiopia. In this part, three papers are contained covering different aspects of natural resources management. The first paper discusses land transaction and market-oriented production in Eastern Shewa, Ethiopia. The study shows that households who rent-in land are engaged in the production of relatively commercial products (such as teff and haricot beans) and their holdings are larger than those farmers who cultivate only own plots. The enterprise choice decision by the farmers depends solely on the profitability rather than on technical yield level.
Land renting-in also results in increased market integration of smallholders. The policy implication of the study is that the alternative land use policy that allows land transaction encourages innovative and landless farmers to acquire land and increase supply of marketable products.

The second paper of the last part deals with the impact of land use rights and access to markets on land uses and rural households' income in Northeast Ethiopia. The study reveals that, in the long run, tenure security is a necessary, but not sufficient condition for environmental rehabilitation and improvement of farm households' income. In the short term, both tenure security and market access have insignificant impact due to high level of poor farm households' time preference (discount rate). The average rate of time preference for sampled households was about 70%. Economic incentives that internalize tree-planting externalities, improvement of wood markets and poverty reduction strategies that reduce the rate of time preference are some of the likely policy recommendations resulting from the study.

The third paper deals with non-timber forest products (NTFPs) and their role in household and national economy in Ethiopia. The paper focuses on the major NTFPs such as forest coffee, honey, gums and resins, spices, game hunting and indirect services, like eco-tourism. The future prospect of NTFPs is also discussed. Recognition of NTFPs in national accounting systems is important for forest resources related policy reform. The paper lays special emphasis on the need of promoting existing markets and exploring new ones with the adaptation of new technologies to enhance commercialisation of these products.

In summary, the findings of these papers underline the fact that farmers need a better economic-environment to produce more for the market. Sector policy should support productivity growth in smallholder agriculture via increased portfolio of enterprise and increased output for markets. This demands an increased responsibility of research and extension systems to supply market-oriented technologies to producers. Equally important is the increasing role of rural institutions, such as markets and finance. It goes without saying that there is a significant synergy between increasing agricultural productivity and lowering market transaction costs. With this scenario, it is hoped that the primary role of agriculture, as supplier of raw materials, will give way to agriculture as business venture on commercial lines. Furthermore, if their management capacity and capital resources could be improved, marketing institutions like co-operatives could bring about effective integration of markets by boosting production, thus
The Editors

enhancing the bargaining power of farmers, improving their access to information, and leading to lower transaction costs.
PART II

POLICIES FOR COMMERCIALISATION OF SMALLHOLDER AGRICULTURE IN ETHIOPIA
POLICIES FOR COMMERCIAL TRANSFORMATION
OF ETHIOPIAN AGRICULTURE

Demese Chanyalew*

Abstract

Policy decisions are fundamentally political decisions. In the last four decades, this fundamental principle is reflected in the commercial agriculture policies of the different regimes of Ethiopia. In this paper, a review of documents related to Ethiopia’s past and recent underlying commercial agriculture policies during various regimes are examined. Relevant secondary data are used to give a quantified explanation to the issues raised and discussed in the paper.

During the Atse Haile-Selassie regime, commercial agriculture was primarily in the hands of private individuals and companies of both domestic and foreign origin. Farmers were kept in smallholder agriculture, footed on a feudal land tenure system. During the Derge’s regime, large farms were in the hands of the government, commonly known as state farms. The EPRDF regime, which came after the Derg, used different policy frameworks during the transition period and after.

In the transition period economic policy there was no explicit statement on how to transform the small-scale peasant agriculture to a commercial one. The Rural Development Policy and Strategies (ROPS) document emphasizes that commercial transformation of agriculture rests on the gradual transition from a farm household consumption-based agricultural production to a market-led production. The Sustainable Development and Poverty Reduction Program (SDPRP) is explicitly in line with EPRDF Government policy to expand medium and large commercial farms in the lowlands without displacing settled farmers. It also affirms that unutilized land in the vicinity of small farmers (even in the highlands) can be rented (leased) and used for modern farming as long as it does not displace small farmers.

From the reviewed documents, two important aspects of commercial transformation of Ethiopia’s agriculture emerge: commercialisation of small-scale agriculture via market-led production and commercialisation via the emergence, growth and expansion of modern agricultural enterprises, be it large or small. However, there hardly exist even today any data or information that indicates the transformation of small-scale agriculture to commercial agriculture in Ethiopia. Recent studies indicate that small-scale farms are still facing problems that obstruct their transformation.

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from home consumption to market-oriented production. The problems include absence of credit facility, poor market infrastructure and facility as well as lack of access to improved technologies.

In general, the policies for commercial transformation of Ethiopian agriculture seem to exist on paper and the changes observed on the ground are not encouraging. Investment-driven commercial agricultural projects are not commencing even at a rate of 50% of the number approved by the Ethiopian Investment Agency. The support and facilities required to transform the small-scale subsistence agriculture are not available adequately and timely. Therefore, either the policies or the institutions to implement them need revision if the commercial transformation of Ethiopian agriculture is to take place effectively and at the expected rate.

1. INTRODUCTION

The topic, which I am invited to write a paper on, has four key words to elaborate, link and examine. These are Policy, Commercialisation, Transformation and Agriculture. These terms call for definitional and conceptual underpinnings in order to write an alluring paper on the topic set a prior. It also entails that the focus is not on a policy of commercial agriculture rather it is on a policy to transform traditional subsistence-oriented agriculture to a commercial one. This is not to say the 95% small-scale subsistence farming has not had a commercial orientation and, hence, it has to be transformed to commercial agriculture. Or it is not assuming that there has not been commercial agriculture in Ethiopia. I suppose, I am invited to write on the present FDRE Government policies for commercial transformation of Ethiopian agriculture in view of what has happened during, at least, the Atse Haileselassie and the Derge regimes.

The commercial agriculture policies of the different regimes are reflections of their political institutions and positions. By institutions it means both the organizational and relational formation of a political system. Again it is often important to recall that policy decisions are fundamentally political decisions. The Atse Haileselassie, the Derege and EPRDF regimes agricultural policies are based on the political and economic systems they follow and implement. Their policy for commercial agriculture is a subset of their agricultural policy.
Policies for Commercial Transformation of Ethiopian Agriculture

The agricultural policy of the Atse Haile Selassie regime had a feudal cum semi-capitalist orientation while the agricultural policy of the Derge regime had a socialist footing. The current EPRDF regime has a mixed type, partly pseudo-capitalist and partly socialist, which is footed on what is known as the revolutionary democracy.

Commercial agriculture during the Atse Haile Selassie regime was primarily in the hands of private individuals and companies of both domestic and foreign origin. Farmers were kept in smallholder agriculture, which was footed on a feudal land tenure system. During the Derge period, large commercial farms, commonly known as state farms, were in the hands of the government. The Derge established large commercial farms using government land during the Third Year Plan (1968-73). It abolished the feudal land tenure system and put land under the public and government ownerships. Farmers were given land under the auspices of the peasant associations’ (PAs) administration.

Again, supposing that the interest of the AESE in inviting this paper is that the author has to focus on the EPRDF regime policies for commercial transformation of Ethiopian agriculture, a review of the major policy documents on Ethiopia’s commercial agriculture after the fall of the Derge and their impact on growth and expansion is made below.

2. EPRDF REGIME POLICIES ON COMMERCIAL AGRICULTURE

The major documents one has to read in order to know the agricultural policies of the EPRDF regime during the transition as well as during its elected periods are:

- Ethiopia’s Economic Policy During the Transition Period (1991)
- Revolutionary Democracy Development Directions and Strategies (text in Amharic, 1992 E.C.)
- Rural Development Policy and Strategies (2003), and
Careful examination of these documents enables to note the EPRDF regime conditional policy setting strategy and the refinements and adjustments made by policy makers as time goes on. The EPRDF regime seems to adhere to the principle of increamentalism in policy making. This principle is based on the paradigm that policy is built step by step, and wise decisions, as well as mistakes of the past, are the foundations for current and future policies.

2.1. The Transition Period Policy

Section two of the transition period policy document covers Ethiopia's agricultural policy. At the very beginning, the policy position of the transition government explicitly states that priority is given to peasant agriculture. It recognizes that while peasant agriculture is more responsive to reforms, agriculture, in general, faces complex problems and requires unreserved efforts for its development. In this regard, the policy on peasant agriculture addressed various issues, including ownership of land, access to free market, resettlement and villagization programmes. But no explicit policy statement is made on how to transform the small-scale peasant agriculture into a commercial one.

The policy document, however, recognized that although priority will be given to the development of peasant agriculture large-scale modern farming should by no means be ignored. In this regard, it encompassed two policy measures, namely expanding modern private farms and reducing the role of state farms.

The transition period policy document states that the government will create enabling conditions to expand modern private farms via the following measures and instruments:

- Provide fertile lands in uninhabited areas on concessionary bases and providing full guarantees to private entrepreneurs, either individually or on a joint venture bases;

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Policies for Commercial Transformation of Ethiopian Agriculture

- Open and fertile lands will be made available to private investors after ascertaining first that this will not result in evictions or affect the interests of peasants and nomads as well as those who practice shifting cultivation;

- Provide incentives in the form of access to bank credit, tax benefits, etc. to encourage the participation of private capital in modern farming; priority will be given to domestic investors unless an undertaking is beyond their capacity;

- Create enabling conditions for the expansion of modern private farming by expanding infrastructure, such as roads, health facilities, etc.

In terms of reducing the role of state farms, the transition period policy was that state farms would not be allowed to continue, as they are. Specifically it states that:

- On the bases of investigations, unprofitable state farms will be handed over to those around the farms or to workers employed on those around the farms or to workers employed on them provided this measure does not lead to conflicts with the nearby population. If this is not possible, state farms will be turned over to private investors on a concessionary basis or the assets on them will be sold and the land returned to the people;

- Parallel measures would have to be taken for providing employment opportunities or other forms of assistance to the redundant labour force, since the closure or sale of state farms will create large numbers of displaced workers;

- When necessary, the state may operate those state farms that are strategic to the economy jointly with domestic or foreign private capital.
2.2. Revolutionary Democracy Development Directions and Strategies

The recent agricultural policies and strategies of the EPRDF government are derived from the front's lead ideological foundation known as "Revolutionary Democracy" which is discussed in detail in the Amharic Book entitled "\textit{S.reload. Addis Ababa, 1992,}\textit{,} which literally translates to "Revolutionary Democracy Development and Strategies."

In this paper, section two lists the sectors strategies including the rural-agricultural development strategy. While the book reaffirms public and state land ownership, it also states that once land is allocated to peasants, the remaining, which cannot be farmed by them, will be given to investors who want to venture on agricultural development enterprises with long-term land lease arrangement.

2.3. Rural Development Policies and Strategies.

The various sectoral discussions contained in the Revolutionary Democracy Directions book were further issued in detail and in separate books. The one, which, deals with rural agricultural development is contained in the FDRE Government Rural Development Policies, Strategies and Instruments (RDPS) document initially in Amharic and later on translated into English. In this document the policy issues related to modern and large-scale agriculture are contained in Part Two, Sections 5 and 7, and no mention of "commercial agriculture is made" in the whole document.

In the RDPS it is stated that Ethiopia's agriculture can achieve rapid and sustainable growth if it is based on producing more than the producers' own consumption and supplying the difference to the market. It is further argued that if the farmer should sell his surplus product, it is the domestic market that should be assessed in the first place.

Secondly, that in order to implement market-oriented system, especially international market-led agricultural development, farmers have to produce market-demanded products at competitive price and quality, decrease cost of production and increase productivity, improve quality at production as well as post-harvest levels. Currently,
agriculture is not market oriented but is limited to farmer's own consumption. Without first being able to produce enough for the farmer's own consumption, there is no need to proceed to market-led agricultural development.

However, the document clearly points out that market-led production is basically an issue of transition. Until favourable condition for market-led agriculture prevail, both the market-led and the one not led by the market will exist simultaneously. Although this process will take time, the national capacity to accomplish the transition to market-led agriculture at the earliest possible time has a fundamental importance to ensure sustainable and rapid development. To accelerate the transition, the system has to start with commodities that are currently produced for the market and, step-by-step, to include all other products. In a similar way, educated and trained farmers should be involved in the market-led development activities from the very beginning.

Section 5.2 of the RDPSI document further elaborates that enabling farmers to produce for the market shall be in tune with the practical necessity of producing market-demanded products at competitive price and quality. In order to continuously improve the farmers' income, it is important not only to increase productivity, but also to continuously shift from low price to high price products.

The above statements, extracted from the Amharic version of the document, indicate that the policy for commercial agriculture is not necessarily large-scale export-oriented production undertaking. As said above, though the term “Commercial” is not used in the RDPS document, the EPRDF regime policy for a seemingly commercial transformation of agriculture, per the RDPS document rests on:

a) The gradual transition from farm household consumption based production to market-led production.
b) Ensuring to produce enough for the farmer's consumption in the process of transition.
c) Concentration on educated and trained farmers in the market-led production activities.

In order to implement these policies, the core strategic instruments are the research extension and marketing agencies and agents. The RDPS document states that establishing effective and efficient research, extension and marketing system is a choice without alternative. The research and extension system should be able to
Demese Chanyalew

develop the required capacity for market-led production, especially international market-led agricultural development.

With regard to agricultural marketing, the document includes statements that without exaggeration, rapid transition and high rate of agricultural development, growth and improvement of agricultural marketing system is impossible without the establishment of agricultural cooperatives. It is stated that cooperatives have a decisive role on agricultural development in general, and on agricultural marketing system in particular. Cooperatives also render vital services other than those related to agricultural marketing, including the following:

- Expanding financial services in rural areas;
- Purchase of agricultural machinery, equipment and implements and lease them to farmers;
- Setting up of small agro-processing industries where processed agricultural products with greater value-added could be produced; and
- Establishing various social institutions to provide different kinds of social services.

Sub-section 5.3 item D of the RDPS gives due recognition to private investors' participation in the agricultural marketing system. In this sub-section, it is stated that unless the key role of the private investors is included, the system may not work at all because there are many holes that cannot be closed by the cooperatives. In this regard, the policy is that, in order to make the marketing system complete and efficient, in addition to strengthening cooperatives, the efficiency of private investors who will work in the network should be strengthened and improved. It is also underlined that a strong control mechanism should put in place to ensure that the private investors, working in collaboration with cooperatives, function in accordance with the principles of free market competition. The government has to ensure the existence of free competition in the network and eliminate all anti-competition practices and exercise vigilance to prevent their recurrence.

In the transition process, the role of financial institutions is also explicitly stated. Section 6 of RDPS contains the policy, strategy and instrument related to the finance system. Banks and cooperatives are expected to provide a significant amount of financial services. Strengthening the collaboration between rural banks and
Policies for Commercial Transformation of Ethiopian Agriculture

coopératives should be given due attention as it strengthens the institutions that have decisive influence on rural and agricultural development.

In terms of the relationship between the investor and farmer, the most famous integrating system, which could be applied as stated in sub-section 7.3 of RDPS, is a production contractual relationship between the two, i.e., encouraging outgrower producers. The outgrower scheme is based on contract farming whereby the contract farmers make a contractual agreement with the investor, who supports the farmers to produce surplus, which they sell to him. However, the policy position is that such contractual relationship could and should mainly be the major strategy on the highlands of the country where there is high population density. Based on this relationship, the investor can pull the amount of land he needs to produce crops, without evicting the farmer from his land. This will greatly strengthen mutual benefit. In the lowlands of the country, where a large amount of land is available for modern farming, the outgrower contract will be no more than a support.

2.4 SDPRP: RDPS in the Process of Refinement

The SDPRP document is a refined extension of the RDPS document in terms of its policy contents. It restates that when the private investors wish to engage themselves in agricultural activities, they can have access to land on a long-term lease basis. It explicitly indicates that the Government’s policy emphasis is to expand medium and large commercial farms in the lowlands provided that such initiatives are not displacing existing settled farmers. Unutilized land in the vicinity of small farmers (even in the highlands) can be rented (leased) and can be used for modern farming as long as it does not displace small farmers. This arrangement is believed to generate positive externalities by way of creating job opportunities and transforming small farmers’ farming practices in the medium and long term. Thus, it is possible to undertake private modern farming both in the highlands and lowlands without wastage of capital and labour. Besides, in the document it is stated that mechanisms are to be devised by regional governments to proactively accommodate the investment requirements for land by prospective commercial farmers.

The SDPRP document sub-section 7.1.4 item "e", which deals with substantial uncultivated land, stipulates, among others, the essence of implementing appropriate settlement programmes side by side with private investors full of entrepreneurial zeal to participate in the establishment of large-scale commercial farms and agro-
industries. Such ventures are targeted to cultivate the large tracts of uncultivated land, particularly in the western lowlands stretching from north to south, which are suitable for agricultural development through irrigation.

3. AGRICULTURE: COMMERCIAL VERSUS MODERN

From the review of existing lead policy documents, two important aspects of commercializing Ethiopia’s agriculture emerge.

1. Commercializing of the small-scale agriculture, via market-led production and
2. Commercialization via the emergence, growth and expansion of modern agricultural enterprises.

In both cases, progress is being made. The second type is indeed emerging and expanding especially with investment in horticulture, particularly flower production.

The above section gives a general and implicit definition and characterization of commercial agriculture in Ethiopia. A dilemma seems to prevail in choosing the terms—commercial and modern—as prefix for agricultural activities, specifically farming, which are market oriented, be it for local, domestic or international markets. It is in the SDPRP document that the term commercial agriculture, distinctively or conjecturally, appeared together with an explanation embedding modern agriculture. In the Transition and Revolutionary Democracy policy documents, as well as in the RDPS document, the emergence of market-oriented farms is associated with modern agriculture. Besides, the delimitation of small-scale and large-scale commercial agriculture is not well defined. An attempt is made below at clarifying the distinction between traditional, modern and commercial agriculture.

Any agricultural operation that has incorporated improved biological, chemical or mechanical agricultural technologies is in the process of modernization irrespective of whether heavy machinery and equipment is used or not.

In developed countries, commercial agriculture is predominantly run by profit-making firms that produce selected agricultural commodities for domestic and international markets. It is a sector with significant investment in advanced agricultural
Policies for Commercial Transformation of Ethiopian Agriculture

technologies and skilled human resources. The agricultural sector is a driving force for the transportation, processing, and manufacturing business of a country. However, in the developed world commercial agriculture is not left for corporate firms only. It can also be a small-scale family-operated venture. For example, commercial agriculture in the state of Missouri, USA, is defined as one which consists of:

1. Family farms where a major part of the family income is derived, and
2. Agricultural business that supports such farms.

The literature also indicates that in some parts of the world commercial agriculture is associated with cultivation of large tracts of land, mainly cash crop production, like rice, citrus fruits, palms, coffee, coca, opium, tea, cacao, rubber and banana. Often, large-scale commercial agriculture excludes smaller farmers and ownership is concentrated in the hands of wealthy minority, who are given government incentives to leave some of their land fallow and not fully employed at any given time.

These large farm businesses are designed to maximize profits and not to benefit the local population, and usually do not employ large number of local farmers. When they do, workers are employed seasonally for low wages. Such practices are wide in Brazil, India and other Latin American and Asian countries.

In Ethiopia, the fate of the large-scale commercial agriculture ceased at the occurrence of the 1974 revolution. The revolution brought in the Derge regime, which embraced a socialist ideology and as a result confiscated all private large-scale commercial farms, particularly in the Awash valley, and eventually converted them into commercialise state farms. As reported earlier, the EPRDF regime, during its transition period, declared the abolishment of state farms. But, in the Revolutionary Democracy, and subsequent RDPS and SDPRP policy statements, small-scale and large-scale commercial agriculture, particularly in the uncultivated low lands of the country, is being encouraged.

Agriculture is a complex industry; hence, agricultural policy is complex too. Simply, but broadly, an agricultural policy involves the setting of societal agriculture and food goals, the agents and agencies that activate and control the means, planning and directives that influence individuals and firms what to produce, how to produce, for

3 Source: http://agebb.missouri.edu/commag/
4 Source: http://www.mongabay.com/0811.htm
whom to produce, how to distribute for consumption and how to enhance the purchasing power of the producer and consumer. Commercial agricultural policy constitutes the same goals, means, agents and implements but with a purposive and strong linkage with production, marketing and value adding practices. Production at commercial farm level is primarily for the market and not for home consumption. Recent studies indicate, depending on the year, about three-quarter of all grain produced in Ethiopia is retained on farm for home consumption or for sowing. From the remainder, farmers sell about 80 per cent immediately after harvest to meet their urgent cash needs and to avoid the inevitable losses that are incurred from traditional on-farm stores. Similarly, production of vegetables and fruits is traditional in nature and lacks commercial orientation. In many areas, vegetable products are not sorted, packed, and loaded with care and as a result quality is compromised. Commercial agriculture is not limited to investors who can acquire land through lease or other arrangements but it also encompasses small-scale farms, which use improved agricultural technology and extension services, increasing their share of marketable surplus or produce.

4. TRANSFORMATION VIA INVESTMENT PROJECTS

From the previous sections the reader might have noticed that the commercial transformation of Ethiopia's agriculture refers to both subsistence peasant agriculture and modern deliberate investment ventures in agriculture.

The policies for commercial transformation of Ethiopian agriculture revolve around two major types of agricultural firms: small-scale and large-scale. Both types can be either a farm or an agribusiness including fishery and forestry. The farms could be capital intensive and commercial oriented like those engaged in the floriculture industry in Ethiopia today. In this regard, it is important to assess the investment indicators of the agriculture and food products sector of the country during the last decade.

The EPRDF regime has taken various policy measures to encourage investment in various sectors of the economy. Between 1984-1995 E.C (1992-2003 G.C.) a total of 8297 investment projects were approved of which 26% are engaged in commercial operations (Table 1). In terms of capital it is only 20.8% of the approved, which is
incurred from the approved amount. From the 2156 investment projects, which commenced operation, 61.1% are in agriculture and food sector; the investment projects that became operational comprise only 26% of the total capital envisaged for all the approved projects. In spite of the low capital employment, employment creation in the agriculture and food sector investment projects was high (Table 2), indicating that the sector is labour intensive. Out of the total employment created by the operational investment projects, 44.4% of the permanent jobs and 98.1% of the temporary jobs created were in the agriculture and food sector.

The proportion of approved commercial investment projects is low when it comes to integrated crop and livestock farming, followed by cash crop farming which is 12.4 and 14.1 per cent respectively (Table 3). For the period 1984-1995 E.C. about 44% of the approved investment projects commenced operation. The development of commercial agriculture in the country is at its infancy, though it is growing steadily as can be seen from the figures in the tables.

The figures above indicate that there is a need to assess the bottlenecks associated with the low proportion of commercial agricultural and food investment projects. This also indicates the emergence of investment based commercial agriculture is at a low pace which may call for policy revision or revision of policy implementing institutions both organizations and their work procedures and relationships. Furthermore, the figures call for policy revision or close scrutiny of policy implementing institutions.

Apart from the above indicators, to measure the commercial transformation of Ethiopian agriculture, hardly there is data and information to indicate the commercial transformation of agriculture in the small-scale agriculture as a major policy measure to transform farms orientation from production for home consumption to production for market both domestic and export. Despite the policy, recent studies indicate that small-scale farms are still facing problems that obstruct their transformation from home consumption to market- and commercial-oriented production. The problems include absence of credit facility, poor market infrastructure and facility, in inability or lack of access or lack of access to improved agricultural technologies such as improved seed, fertilizer etc. Again this situation calls for a revision of the policy or its implementation to transform Ethiopian small-scale agriculture into a commercial one.
Table 1. Number and Investment Capital of Projects Approved and Commenced Operation by Sector and Type
(Investment Capital in Million Birr)

<table>
<thead>
<tr>
<th>Sector/Sub-sector</th>
<th>Cumulative Approved*</th>
<th>Commenced Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Projects</td>
<td>Investment Capital</td>
</tr>
<tr>
<td></td>
<td>Per cent</td>
<td></td>
</tr>
<tr>
<td>Natural Resources</td>
<td>0.83</td>
<td>0.75</td>
</tr>
<tr>
<td>Agriculture and Food</td>
<td>36.16</td>
<td>17.67</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>22.66</td>
<td>23.11</td>
</tr>
<tr>
<td>Services</td>
<td>40.35</td>
<td>58.47</td>
</tr>
<tr>
<td>Grand Total</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>No/Amount</td>
<td>8297</td>
<td>91561.81</td>
</tr>
</tbody>
</table>

Cumulative Approved = Total Approved-Terminated-Inactive.
### Policies for Commercial Transformation of Ethiopian Agriculture

Table 2. Expected Employment Creation of Domestic and Foreign Investment Projects which have Commenced Operation
Hamle 1984 – Sene 30, 1995 E.C.

<table>
<thead>
<tr>
<th>Sector/Sub-sector</th>
<th>Domestic</th>
<th>Foreign*</th>
<th>Total (D+F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Permanent</td>
<td>Temporary</td>
<td>Permanent</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>3713</td>
<td>1079</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Agriculture and Food</td>
<td>39192</td>
<td>276529</td>
<td>3294</td>
</tr>
<tr>
<td></td>
<td>47.2</td>
<td>98.4</td>
<td>25.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>16317</td>
<td>838</td>
<td>3181</td>
</tr>
<tr>
<td></td>
<td>19.6</td>
<td>0.3</td>
<td>25.0</td>
</tr>
<tr>
<td>Services</td>
<td>23839</td>
<td>2594</td>
<td>6137</td>
</tr>
<tr>
<td></td>
<td>28.7</td>
<td>0.9</td>
<td>48.3</td>
</tr>
<tr>
<td>Grand Total</td>
<td>83061</td>
<td>281040</td>
<td>12711</td>
</tr>
<tr>
<td>Per cent</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*Wholly Foreign and Joint.*
Table 3. Number and Investment of Capital of Projects Approved and Commenced Operation in the Agriculture and Food Sector

Hamle 1984 – Sene 30, 1995 E.C

<table>
<thead>
<tr>
<th>Sub-Sector</th>
<th>Cumulative Approved</th>
<th>Commenced Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Projects</td>
<td>Investment Capital in Millions Birr</td>
</tr>
<tr>
<td>Food Crops farming</td>
<td>295</td>
<td>2377.73</td>
</tr>
<tr>
<td>Cash Crops farming</td>
<td>201</td>
<td>2785.30</td>
</tr>
<tr>
<td>Mixed food and Cash Crops farming</td>
<td>323</td>
<td>2189.98</td>
</tr>
<tr>
<td>Livestock farming</td>
<td>414</td>
<td>829.35</td>
</tr>
<tr>
<td>Integrated Crops and Livestock farming</td>
<td>90</td>
<td>426.06</td>
</tr>
<tr>
<td>Agricultural Services</td>
<td>210</td>
<td>729.82</td>
</tr>
<tr>
<td>Fishing</td>
<td>7</td>
<td>21.94</td>
</tr>
<tr>
<td>Food Products</td>
<td>740</td>
<td>5111.84</td>
</tr>
<tr>
<td>Coffee hulling</td>
<td>680</td>
<td>1310.17</td>
</tr>
<tr>
<td>Coffee cleaning and exporting</td>
<td>38</td>
<td>400.10</td>
</tr>
<tr>
<td>Total Number</td>
<td>3000</td>
<td>16182.29</td>
</tr>
<tr>
<td>Per cent</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
5. CONCLUSION

The policies for commercial transformation of Ethiopian agriculture seem to exist only on paper. The changes observed on the ground are not encouraging. Investment in commercial agricultural projects is not yet promising. Investment based commercial agricultural projects are not commensurate with the number of projects approved by the Ethiopian Investment Commission; the support provided and facilities required to transform the small-scale subsistence agriculture of Ethiopia are not adequately and timely put in place. Either the policies or their implementing institutions need revision if the commercial transformation of Ethiopian agriculture has to take place at a faster rate.
Demese Chanyalew

References


Source: http://agebb.missouri.edu/commag/
Source: http://www.mongabay.com/0811.htm
ANALYSIS OF COMPARATIVE ADVANTAGES OF DOMESTIC PRODUCTION VERSUS IMPORTATION OF DURUM WHEAT

Senait Regassa*, Bemnet Gashawbeza** and Fasil Kelemework+

Abstract

Nowadays, there is a growing consensus that poverty alleviation cannot be realized unless the farming sector is transformed from subsistence farming to market-oriented production. One way of promoting commercialisation of smallholder farmers is through strengthening the forward and backward linkages between agriculture and industry. Forward linkage between industry and agriculture can be created and/or strengthened if farmers specialize in industrial crops in which they have comparative advantage, and that can be used as raw materials in manufacturing industries.

This paper analyses the comparative advantage of importation of durum wheat vis-à-vis producing it locally. Data used in this study were collected in 2004 through a formal survey of about 115 durum wheat growers in Ada-Liben and Lume districts and interviews conducted with officials of pasta-making factories. A Policy Analysis Matrix (PAM) was used to analyze the data. The analysis was done at farmers' level. The result of the study has shown that substituting durum wheat import by local production improves both social and private profitability and saves foreign currency. Therefore, a gradual substitution of durum wheat import is of vital importance for the improvement of smallholder income and profitability of the factories.

1. INTRODUCTION

Although agriculture is the mainstay of the Ethiopian economy, agricultural productivity and production are among the lowest in the world leading to poor...
economic growth and chronic food insecurity in some parts of the country. Cognizant of this fact and the potential of agriculture as an engine of economic growth, the Government of Ethiopia had launched an Agricultural Development-Led Industrialization policy. In due course, however, it was realized that productivity growth alone couldn’t ensure poverty alleviation. The role that efficient markets play in this regard has become a point of concern to policy makers and other stakeholders.

Nowadays, there is a consensus that poverty alleviation cannot be realized unless the farming sector is transformed from subsistence farming to market-oriented production. This calls for the introduction and popularization of agricultural outputs that have high market demand.

The Debre Zeit Agricultural Research Centre has been working on several technologies that are relevant to market-oriented production. Research on durum wheat is a typical example. To date, 23 improved varieties of durum wheat have been released (16 by DZARC, 4 by Adet, 2 by Sinana and 1 by Sirinka Agricultural Research centres). Among the 16 wheat varieties released by DZARC, 9 have been found suitable to meet the standards set by local processing industries.

Although Ethiopia has a favourable agro-ecology for durum wheat production, until now durum wheat has been imported to meet the need of the processing industries in the country. This has the effect of draining the meagre foreign currency the country has and denying local farmers of the opportunity of availing themselves, price wise, from the production of durum wheat. The objective of this paper is to analyze Ethiopia’s comparative advantage in producing, vis-à-vis importing, durum wheat.

2. METHODOLOGY

The study was conducted in Ada-Liben and Lume districts of East Shoa zone. These areas were selected because they have suitable agro-ecology for durum wheat production. The two districts, in addition to being traditional durum wheat growers, lie within the vicinity of major pasta-making industries of the country.
Data were collected using both formal and informal surveys. For the formal survey a structured questionnaire was prepared and administered to purposively select 115 durum wheat growers in Ada-Liben and Lume districts. Information was also gathered from various stakeholders, such as pasta-making factories, using checklists. Policy Analysis Matrix (PAM) was used to analyze the data.

2.1. General Framework of a Policy Analysis Matrix (PAM)

Policy Analysis Matrix (PAM) is one of the techniques that can be employed to assess the effects of policies on the comparative advantages of imported goods vis-à-vis locally produced commodities. The general framework of a Policy Analysis Matrix is presented in Table 1. Both private and social profitability are measured in a framework of a Policy Analysis Matrix. Private profitability is calculated as the difference between private revenue (A) and costs of both tradable and non-tradable inputs (B+C). The prices used in measuring private profitability are domestic market prices.

Social profitability, a measure of economic efficiency, is equal to social revenue (E) minus cost of tradable and non-tradable inputs (F+G). Because social values are the values given under the assumption of no policy interventions and the existence of competitive markets for inputs and outputs, export and import goods (for both input and output) are measured at f.o.b. (free on board) price and at c.i.f. (costs, insurance, freight) price respectively (Huang et al., undated). Furthermore, there is a need to adjust border prices for inland transportation costs.

Social profitability is a measure of comparative advantage. At the margin, a positive social profit indicates that the system uses scarce resources efficiently and the commodity has a static comparative advantage. At the margin, a negative social profitability implies that it is cheaper to import the commodity than to produce it locally. In other words, the real cost of producing the commodity exceeds the cost of importing it (Huang, et al., undated).

The last row of PAM measures the divergence between private and social valuation of revenues, costs and profits. In other words, it gives the effect of policies on economic efficiency. Output transfers (A-E), denoted by l, gives the amount of output
value transferred from society to individuals. Tradable inputs and domestic factor transfers can be calculated using the same logic.

Several coefficients that measure the effect of government policies on the efficiency of a given commodity can be derived from the Policy Analysis Matrix. These include the Nominal Protection Coefficient (NPC) for outputs and tradable inputs, the Effective Protection Coefficient (EPC), and the Domestic Resource Cost (DRC) ratio.

<table>
<thead>
<tr>
<th>Table 1. General Framework of a Policy Analysis Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
</tr>
<tr>
<td>Revenues</td>
</tr>
<tr>
<td>Tradable Inputs</td>
</tr>
<tr>
<td>Domestic Factors</td>
</tr>
<tr>
<td>Profits</td>
</tr>
<tr>
<td>Private values</td>
</tr>
<tr>
<td>Social values</td>
</tr>
<tr>
<td>Divergences</td>
</tr>
</tbody>
</table>

Private profits: \[ D = A - (B+C) \]
Social profits: \[ H = E - (F+G) \]
Output transfers: \[ I = A - E \]
 Tradable input transfers: \[ J = B - F \]
Domestic factor transfer: \[ K = C - G \]
Net transfers: \[ L = D - H = I - (J+K) \]


The Nominal Protection Coefficient measures the impact of commodity-specific price interventions, such as import tariffs. NPC for outputs is given by the ratio of private revenue to social revenue (A/E). An NPC greater than one implies that the domestic output is protected, and vice versa, if the ratio is less than one. A Nominal Protection Coefficient for tradable inputs is expressed as B/F (the ratio of value of tradable inputs at local market prices to value of tradable inputs at world market prices).

Effective Protection Coefficient (EPC), which measures the total effect of government intervention, can be calculated from the Policy Analysis Matrix as a ratio of value added in local market prices (A-B) to the value added in world prices (E-F).

Thus, \[ EPC = \frac{(A-B)}{(E-F)} \]. If EPC is greater than one, it means that government intervention has favoured local production although it is more economical to import the commodity.
Analysis of Comparative Advantages of Domestic Production Versus Importation of ...

DRC is the ratio of domestic factors of production in economic values (G) to value added again in economic terms (E-F), i.e. $G/(E-F)$. It indicates the cost of domestic factors that has to be incurred to obtain one unit of value added in economic terms. A Domestic Resource Cost Ratio of less than one implies that the commodity has comparative advantage.

3. RESULTS

There are two types of costs involved in durum wheat production. These are tradable inputs and domestic factors/non-tradable. Tradable inputs are inputs that are traded in the international market, whereas domestic factors are those for which there is no international market. In the case of durum production, tradable inputs are seeds, fertilizers and herbicides; domestic factors include labour for ploughing, planting, weeding, harvesting, transporting to threshing ground, and threshing. The seed rate used by farmers was 188.60 Kg/ha (Table 2). Farmers applied an average rate of 152.61 Kg/ha of Dap and 101.50 Kg/ha of urea. The average rate of herbicide applied was 0.16 litre/ha.

<table>
<thead>
<tr>
<th>Type of Input</th>
<th>Rate of Application/Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tradable</td>
<td></td>
</tr>
<tr>
<td>Seed (Kg/ha)</td>
<td>188.60</td>
</tr>
<tr>
<td>DAP (Kg/ha)</td>
<td>152.61</td>
</tr>
<tr>
<td>Urea (Kg/ha)</td>
<td>101.50</td>
</tr>
<tr>
<td>Herbicide (litre/ha)</td>
<td>0.16</td>
</tr>
<tr>
<td>Domestic factors/Non-tradable</td>
<td></td>
</tr>
<tr>
<td>Labour (man-days/ha)</td>
<td></td>
</tr>
<tr>
<td>Ploughing</td>
<td>17.50</td>
</tr>
<tr>
<td>Planting</td>
<td>6.35</td>
</tr>
<tr>
<td>Weeding</td>
<td>42.45</td>
</tr>
<tr>
<td>Harvesting</td>
<td>27.51</td>
</tr>
<tr>
<td>Transporting to threshing ground</td>
<td>17.15</td>
</tr>
<tr>
<td>Threshing</td>
<td>27.51</td>
</tr>
<tr>
<td>Total labour input (man-days/ha)</td>
<td>138.47</td>
</tr>
</tbody>
</table>

Source: Own survey.
A non-traded input is an input that is not traded across the national boundaries of a particular country, either because of its cost of production or restrictive trade practices. A common example is unskilled labour and land (Gittinger 1982). In the case of durum wheat production in Ethiopia, labour is the only input in the category of non-tradable. The total labour input used by farmers was estimated to be 139 man-days/ha (Table 2). Weeding is the most labour-intensive activity, followed by harvesting and threshing.

Economic profits are the basic components of a Policy Analysis Matrix (PAM). They act as signals for the optimal allocation of resources. There are two types of profits—private profits evaluated at market prices, and social profits evaluated at social or efficiency prices. If there are no market distortions, the two are often the same. If, however, there exist market failures or distortions then they would diverge from one another. Their divergence would act as a signal for the need of policy intervention by the government. (http://socserv.mcmaster.ca/kubursi/ebooks/policy.htm).

Domestic market prices of inputs and outputs, which are used to calculate private revenues and private profits, are given in Table 3. The table also shows c.i.f. prices adjusted for inland transport costs for tradable inputs. In this study, it was assumed that wage rate of labour is a good estimator of the economic value of labour. Hence, the domestic wage rate was used to estimate the social value of a domestic factor labour. This assumption is in line with the assertion made by Gittinger 1982: that, even in labour abundant societies, there are probably peak seasons at planting and harvesting times when most rural labour is probably a pretty good estimate of its opportunity cost and its marginal value product. Thus, we can accept the market wage as the economic value of rural labour.

The result of the Policy Analysis Matrix has shown that producing durum wheat locally has a social profit of about 1385 Birr/ton of durum wheat (Table 4). Since social profitability is a measure of comparative advantage, a positive social profit at the margin indicates that the system uses scarce resources efficiently. If the social profit had been negative one would conclude that it is cheaper to import the commodity than to produce it locally. In the case of durum wheat, Ethiopia has a clear comparative advantage of producing it.
Analysis of Comparative Advantages of Domestic Production Versus Importation of...

Table 3: Prices of Inputs and Outputs

<table>
<thead>
<tr>
<th>Type of Input</th>
<th>Unit</th>
<th>Domestic Market Price</th>
<th>World Market Price*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output (Durum wheat grain)</td>
<td>Birr/tone</td>
<td>1726.4</td>
<td>2459.93</td>
</tr>
<tr>
<td>Tradable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed</td>
<td>Birr/kg</td>
<td>2.02</td>
<td>2.46</td>
</tr>
<tr>
<td>DAP</td>
<td>Birr/kg</td>
<td>2.59</td>
<td>2.31</td>
</tr>
<tr>
<td>Urea</td>
<td>Birr/kg</td>
<td>1.88</td>
<td>1.54</td>
</tr>
<tr>
<td>Herbicide</td>
<td>Birr/kg</td>
<td>54.69</td>
<td>30.77</td>
</tr>
<tr>
<td>Domestic Factors/Non-tradable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ploughing</td>
<td>Birr/man-day</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Planting</td>
<td>Birr/man-day</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td>Birr/man-day</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>Birr/man-day</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Transporting to threshing ground</td>
<td>Birr/man-day</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Threshing</td>
<td>Birr/man-day</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data for domestic prices are own survey and for world market prices are from Ambasel Trading Enterprise.

* World market prices for durum wheat grain, Dap, Urea and Herbicides are calculated as the sum of c.i.f at Djibouti port and inland transport cost.

If the value of output transfers is negative, then social revenues are greater than private revenues. This means that the Government is taxing instead of subsidizing the producers (http://socserv.mcmaster.ca/kubursi/ebooks/policy.htm). The divergence between private and social valuation of revenues was calculated to be about 730 Birr per ton.

The Nominal Protection Coefficient (NPC) for outputs that measures the impact of commodity-specific price interventions, such as import tariffs, was found to be 0.70, indicating that durum wheat production is not protected. The Effective Protection Coefficient (EPC), which is given by the ratio of the value added in local market prices to the value added in the world prices, was calculated to be 0.61. This again indicates that the value added in durum wheat production, in terms of social prices, is higher than the value added, in terms of domestic prices. Local production of durum wheat maximizes both private and social profits. Domestic Resource Cost Ratio (DRC), that measures the cost of domestic factors that has to be incurred to obtain one unit of value added in economic terms for durum wheat, was found to be 0.27, indicating that the commodity has comparative advantage.
Table 4. Policy Analysis Matrix for Durum Wheat Production in Ethiopia

<table>
<thead>
<tr>
<th>Costs</th>
<th>Revenues</th>
<th>Tradable Inputs</th>
<th>Domestic Factors</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private values</td>
<td>1730</td>
<td>576.33</td>
<td>499.64</td>
<td>654.03</td>
</tr>
<tr>
<td>Social values</td>
<td>2459.93</td>
<td>575.12</td>
<td>499.64</td>
<td>1385.17</td>
</tr>
<tr>
<td>Divergences</td>
<td>-729.93</td>
<td>1.21</td>
<td>0.00</td>
<td>-731.14</td>
</tr>
</tbody>
</table>

Private profits 654.03
Social profits 1385.17
Output transfers -729.93
 Tradable input transfers 1.21
Domestic factor transfer 0.00
Net transfers -731.14

Nominal Protection Coefficient (NPC) 0.70
Effective Protection Coefficient (EPC) 0.61
Domestic Resource Cost Ratio (DRC) 0.27

Source: Own calculation.

4. CONCLUSION AND RECOMMENDATIONS

Promotion of market-oriented production by smallholder farmers is crucial for poverty alleviation in countries like Ethiopia where the overwhelming majority of the poor are rural farm families. Limited participation of poor farmers in expanding domestic and international markets has perpetuated their poverty. Obviously, there are some sub-sectors in which smallholder farmers could successfully participate to improve their income level if constraints were removed and arrangements were made and in which the actors in the sub-sector were driven by profitability. This would ensure sustainable functioning of the sub-sector.
Durum wheat had been a traditional crop in Ada-Liben and Lume districts. However, in spite of the growing demand for it by pasta-making factories there has been a shift to other crops during the last decade. Pasta-making factories, especially the bigger ones, import hard wheat at a price considerably higher than the price local farmers would have been ready to supply good quality durum. Some technical and managerial reasons have led to an uneconomical importation of a commodity in which Ethiopia has a comparative advantage. As a result, farmers as well as pasta-making factories, experience loss of income.

Substituting durum wheat import by local production improves both social and private profitability. Moreover, it saves foreign currency. Therefore, a gradual substitution of durum wheat import, by linking local durum wheat growers and pasta-making factories, is of vital importance for the improvement of smallholder income and profitability of the factories. This would require willingness on the part of the pasta-making factories to cooperate with the enforcement of a durum wheat policy that would allow importation only on availing evidence of unavailability of the required type and quality of grain in the country.
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PART III

AGRICULTURAL TECHNOLOGIES AND COMMERCIALISATION OF SMALLHOLDER AGRICULTURE IN ETHIOPIA
Integrated rural development projects were considered as the most effective tools to bring about maximum impact with a short period of time. Hence, agricultural commercialisation, particularly with the production of new agricultural technologies for local markets and export, has become an important policy measure in many developing countries.

The income effects from the adoption of new agricultural technologies mainly depend on the agricultural extension services that stimulate the adoption of recommended farming techniques and practices for successful technology transfer-extension. The adoption and impact assessment of sweet potato production technologies in Southern Ethiopia, on a total sample size of 161 households, indicate that about 93% of sample farmers adopted improved sweet potato varieties. Only 7% were non-adopters of the varieties. The study also attempted to empirically examine factors affecting adoption of improved sweet potato varieties using probit model.

The impact of adopters of improved sweet potato varieties also portray an increase in the farmers' production of sweet potato varieties and improve their income as farmers adopted new sweet potato varieties. The economic analysis, using the partial budgeting method of the adopted improved sweet potato varieties, also confirmed its profitability, which also enhances the commercialisation of new agricultural technologies that enable farmers to produce for own consumption and market.
1. INTRODUCTION

This paper reviews the survey for adoption and impact assessment of sweet potato production technologies as well as sweet potato marketing which enhances commercialisation of agriculture among smallholder farmers in Southern Ethiopia.

In Ethiopia smallholder dominated farming is a sector directly or indirectly providing livelihood for more than 85 per cent of the population. It also provides about 90 per cent of foreign exchange earnings and contributes to about 50 per cent of the Gross Domestic Product (GDP) of the country.

Sweet potato (*Ipomoea batatus* L.) is one of the very important food crops in Ethiopia, especially in the southwest and eastern parts of the country. Sweet potato has been cultivated in the southern region of Ethiopia for a long time. It is not known when it was introduced to the region.

In Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia, sweet potato is an important food security crop and it is a staple or co-staple food for the majority of the people in the region. In area coverage and production, it is the second important root crop next to *enset* (false banana). Nationally, it occupies an area of about 49,000 hectares of land with an annual production of 343,573 tons and the SNNPR alone accounts for about 63% (224,487.1 tons) of total production in the country (CSA 1994). Currently, sweet potato area coverage and production increased to 52,021.71 ha and 379,758.48 tons, respectively in SNNPR (BOA 1999). Next to SNNPR, Oromiya (Region 4) accounts for about 34% of the total production in the country.

In spite of the long history of cultivation and suitable climatic and edaphic factors for the growth of sweet potato, the national average yield is estimated at 7 tons/ha (CSA 1994) and the average yield of sweet potato in the region is about 7.2 tons/ha, which is very low as compared to world average.

Sweet potato consumption among rural households in the Southern Region of Ethiopia has a long tradition and culture. The crop is a staple food in many parts of the region. It is the most important food security crop, especially during drought seasons. Rural household consumption of sweet potato patterns has not changed
over the last several decades in the region. Undoubtedly, many factors might be responsible for this. Understanding of these factors calls for market assessment of agricultural products in Ethiopia in general, and Southern Region in particular.

Often, agricultural households in developing countries are confronted with the problem of poor market access for their agricultural products. As a result, the decision prices are shadow prices which are determined by the equilibrium between production and consumption. Hence, production and consumption decisions are non-separable and are estimated simultaneously (Singh et al., 1986). In such situations, agricultural households' income is determined by household's production activities and changes in factors influencing production activities, which consequently change household income and consumption behaviour. Therefore, estimation of household model on the assumption of inseparability of production and consumption decisions provides estimates of elasticity different from the usual way of demand estimation and it also provides a vital link between the demand and supply side responses to exogenous policy changes (Singh et al., 1986).

1.1. Objectives of the study

1. To investigate the extent of adoption and identify factors affecting improved packages of sweet potato production technologies,
2. To estimate sweet potato demand and consumption level, and
3. To assess the impact of sweet potato production technologies at farm level.

2. MATERIALS AND METHODS

The data for this study were collected from secondary and primary sources in April 2003. The major sources of secondary data were published and unpublished reports collected from zonal and wereda offices of agriculture, non-governmental organizations, such as World Vision Ethiopia, private farms and churches. In addition to the secondary data, Participatory Rural Appraisal (PRA) and formal survey methodology were employed to identify the factors influencing adoption of sweet potato production technologies and the impact of these technologies on the livelihood of smallholders.
Structured questionnaire was designed and pre-tested before the formal survey in order to see the compatibility and comprehensiveness of the questionnaire and necessary modifications were made based on the pre-test. Trained technical assistants of Awassa Agricultural Research Centre, the majority of whom are diploma holders from agricultural colleges, conducted the survey. Although the study was initially to be conducted in Sidama and Wolaita Zones, one additional zone, Kembata zone, which had a better intervention in the past, was included. Four weredas (districts) were selected for this study, namely Awassa Zuria, Boloso Sore, Damot Gale and Omo Sheleko. Two peasant associations (PAs) per wereda, based on their production potential, were selected for the formal survey. Farmers were selected randomly in each PA. The total sample size from the four weredas was 160. Before the launching of the formal survey, discussions were made with key informants, such as development agents, farmers and wereda experts.

2.1. Description of the Study Area

This study was conducted in the southern part of Ethiopia, namely in Sidama, Wolaita and Kembata-Tembaro Zones. Subsistence small-scale crop-production and livestock husbandry are the main economic activities of the farmers in the study areas. The major crops grown include, among others, maize, sweet potato, enset (false banana), Irish potato, taro, cassava and yam. Root crops such as sweet potato and enset, are staple foods for the majority of the farmers and consumption pattern usually varies with the availability of other crops such as maize, teff, and haricot bean among others. Farmers in Sidama and Wolaita zones have relatively good market access for their agricultural products, and usually sell at nearby markets. But farmers in Kembata-Tembaro, particularly in Omo-Sheleko district, do not have good access to the market. With the introduction of improved sweet potato varieties by research organizations, farmers in the study areas benefited much from the improved varieties. About 93% of the sample households (N=161) were using improved sweet potato varieties. One district each from Sidama (Awassa Zuria) and Kembata-Tembaro (Omosheleko) districts and two districts from Wolaita (Boloso and Damot Gale) were selected for this study.
2.2. Results and Discussion

The results of both informal and formal survey conducted in the study areas indicated that about 93 per cent of the sample farmers adopted the improved varieties, namely Gadissa (Awassa 83) and Ogan segan. The key informant interviews and questionnaire survey confirmed that sweet potato butterfly is the number one problem that researchers should look into future breeding programme. The adoption of improved sweet potato varieties, such as Gadissa and Ogan Segan, significantly improved household food security status and income level in all the surveyed areas.

Probit model was used to identify factors affecting adoption of sweet potato varieties. Age, distance from market, male workforce, availability of off-farm income, oxen to land ratio, livestock ownership, livestock pressure per cultivated land, consumer to worker ratio, farm income, maize consumption by the household, and possession of radio receiver significantly influence farmers' improved sweet potato adoption decisions (Annex 1 and Annex 2).

3. PROBIT ANALYSIS FOR SWEET POTATO DEMAND

Determinants of household decision to consume sweet potato or not are modelled using a discrete choice Probit model following a stepwise Maximum Likelihood estimation procedure. The results of this study confirm a priori expectation in that the demand for sweet potato is influenced by the simultaneous interaction of several demographic and socio-economic factors. Out of 19 explanatory variables hypothesized to influence the demand for sweet potato consumption, 7 were found to be statistically significant. These factors include age of household head, education, location, distance from market place, availability of off-farm income and landman ratio (the ratio of cultivated land to total family size) (Annex 3).

The demand for sweet potato consumption was found to be negatively and significantly influenced by the age of the household head at 5% level of significance, as older farmers were found to prefer more sweet potato than younger farmers. The above findings are in conformity with the result of the informal survey. Many farmers reported that sweet potato is consumed more by children than older members of the family due to several cultural reasons associated with sweet potato consumption,
Getahun Degu, Million Tadesse and Assefa Tofu

which results in alleged problem of impotence. Hence, as the age of a household head progresses, his consumption of sweet potato decreases.

The variable, education of household head, positively and significantly influences the demand for sweet potato consumption at 10% level of significance. This may be due to the fact that education has an impact on household consumption pattern, as households have come to realize the essence of improved sweet potato consumption. The above was claimed to be true by governmental and non-governmental organizations in the study areas.

Sweet potatoes demand significantly varies from place to place. The model indicates that factors, which vary across locations, seem to be captured by this model very well. The variable distance from market, measured in kilometres, was found to influence the demand for sweet potatoes negatively at 1% level of significance. Farmers who are closer to marketplaces consume more sweet potatoes than those living far from the market.

The dummy variable, availability of off-farm income, influences sweet potato consumption demands positively at 1% level of significance. Household heads that are engaged in off-farm activities consume sweet potato more than those who are not engaged in off-farm activities. Often, households involved in off-farm activities are poor and landless. As a result, it is cheaper to buy sweet potatoes than other cereal crops to meet the daily food requirement of the whole family. Hence, the demand for sweet potato consumption is relatively high for these groups of rural society.

The variable landman was found to influence household's decisions to consume sweet potato positively at 10% level of significance. Households with relatively large area of cultivated land often plant sweet potato more than those who do not have enough cultivated land, compared to their family size.

4. FACTORS EXPLAINING AMOUNT OF SWEET POTATO CONSUMED

Household decision to consume sweet potato or not was modelled by probit model as outlined earlier. The other issue we are going to see is that having decided positively
to consume sweet potato, there are also factors which influence households' decision regarding the amount or quantity demanded. In probit analysis, regardless of the amount expended on sweet potato, households are categorized on the basis of their consumption of sweet potato. The results of descriptive statistics indicated the average expenditure for sweet potato was about 133 Birr per annum although the maximum amounts to about 1863 Birr per annum (Annex 1). As was indicated earlier, to test the problem of sample selection bias, Heckman's two-step estimation procedure was employed.

4.1. Tobit Estimates on the Level of Sweet Potato Consumed

The dependent variable, which is censored in Tobit model, is the amount of sweet potato consumed (expenditure) in Birr per annum. The model was estimated using ML estimation procedure. Out of 19 variables hypothesized to influence the amount of sweet potato demanded, 10 variables were found to significantly influence the amount of sweet potato demanded (Annex 4). Among the 10 variables which influence the amount of sweet potato consumed, 6 variables (such as locations, livestock ownership in TLU), shadow price of sweet potato, full income (profit) and landman ratio positively influence at 1% level of significance (Annex 4).

Sweet potato consumption expenditure elasticity is higher for those households who have relatively large number of animals. This might be due to the fact that farmers often mix livestock products, such as milk, with boiled sweet potato. As a result, the amount of sweet potato consumed is positively and significantly influenced by the number of livestock owned by the household. On the other hand, the variable livestock pressure, the ratio of total number of livestock to cultivated land, was found to negatively influence the demand for sweet potato at 5% level of significance. This indicates that households with relatively large number of animals, as compared to their cultivated land, face shortage of land and allocate only a small plot of land for sweet potato. Hence, they are often net buyers of sweet potato to satisfy their consumption demand (Annex 4).

The variable shadow price of sweet potato negatively influences sweet potato consumption demand at 1% level of significance. Since this variable is the equilibrium between production and consumption, it indicates the existence of large number of net buyers of sweet potato in the study areas. Hence, it can be said that the current
production level is less than the demand for this product. The variable full income was found to positively influence sweet potato consumption demand at 1% level of significance. This indicates that household sweet potato consumption demand increases because of the increase in farm profit, which is consistent with previous studies made using household models (Singh et al., 1986). Hence, sweet potato is not an inferior good, rather it is a normal good having income elasticity ($0 < \eta_i < 1$), which is a necessity good (Annex 4).

The variable landman was found to influence the amount of sweet potato consumed positively at 1% level of significance. Because households who have relatively large area of cultivated land often plant sweet potato more than those who do not have enough cultivated land. As a result, their consumption expenditure for sweet potato is much higher.

### 5. MARGINAL EFFECTS (ELASTICITY ESTIMATION)

All qualitative and quantitative explanatory variables do not have the same level of impact on household decisions to consume and the level of sweet potato consumption. The marginal effect of a change in $x_k$ upon the expected outcome $y_i$ (probability of sweet potato consumption) was calculated for Probit model following Wooldrige 2002.

The relative importance of significant qualitative explanatory variables included in the Probit model can be seen by examining the changes in probabilities that would result from changes in values of these variables between zero and one. Interpretation of estimated coefficients in both models is not the same as the linear probability model. Sweet potato consumption declines by about 0.01 per cent as the age of household increases by one per cent, implying older household heads do not allocate much of their budget for sweet potato rather they opt for cereals, such as maize. Educated household heads have a strong affinity for sweet potato consumption (0.2%) as compared to non-educated, (in moving from zero to one), keeping all other variables constant (Annex 5).
The demand for sweet potato consumption increases by about 0.03% if the distance from the nearby marketplace decreases by 1%. Households who have better access to the market were found to be high sweet potato consumers. This is because farmers who have better access to market are high producers as well as consumers of sweet potato as a result of the inseparability of production and consumption decisions. Households engaged in off-farm activities have a 20% higher probability of sweet potato consumption than those who are not engaged in off-farm activities. Often poor and landless people are usually involved in off-farm activities and it is cheaper for them to consume more of sweet potato than cereals, such as maize. Hence, their consumption pattern is highly influenced by sweet potato.

The marginal effects (expenditure elasticity) as a result of changes in explanatory variables on the amount of sweet potato consumed were presented in Tobit model (Annex 6). The results of the model indicate sweet potato consumption expenditure decreases by about 3% as the age of household head increases by 1%, implying older household heads have lower budget share for sweet potato as compared to younger ones.

Sweet potato consumption expenditure significantly varies across locations at 1% and 10% level of significance for Wolaita and Kembata-Tembaro zones, respectively. A 1% decrease in average distances from marketplaces increases sweet potato consumption demand by about 11%, implying households closer to marketplaces have higher sweet potato consumption expenditure or allocate a good portion of their budget for sweet potato. A 1% increase in livestock number per household results in 48% increase in sweet potato consumption demand. This indicates that households with relatively large number of livestock have a higher elasticity of expenditure for sweet potato. A 1% increase in household profit (full income) results in about 0.1% increase in sweet potato consumption demand. Thus, sweet potato is not an inferior good rather it is a normal good, having income elasticity greater than zero. A 1% increase in the price of sweet potato results in 0.9% decrease in the demand for sweet potato.

The variable, cultivated land per family size, was found to have extremely higher impact on sweet potato consumption expenditure. A 1% increase in landman ratio results in about 604% increase in sweet potato consumption expenditure, indicating shortage of land is binding in the study areas for sweet potato production and
consumption, as the two decisions are non-separable in developing economies. Therefore, it can be concluded that the impact of each explanatory variables is different on sweet potato consumption expenditure.

6. SWEET POTATO MARKETING

The sweet potato marketing study by Million (2002) identified five marketing channels. The first is where farmers directly sell to rural consumers in rural markets. The second is where farmers directly sell to urban consumers in bigger markets, like in Wolaita Sodo, Areka, Boditi and Shashemene towns. The second channel is of short duration unlike the first one. The third channel is through petty rural traders who either directly sell the sweet potato to rural consumers and/or pass it over to wholesalers. The fourth is through collectors who pass the sweet potato to wholesalers. The fifth, and the most significant channel in terms of volume, is the case where farmers sell their produce directly to wholesalers. The marketing hurdles identified were: lack of market outlet, storage and processing, lack of market information, capital constraints, absence of control on un-licensed traders and high transportation cost and market risks.

Recurrent seasonal price pattern is visible every twelve months. Such a regular pattern arises from seasonality in demand, supply and marketing or a combination of the two. Most agricultural products are characterized by some seasonality in production and marketing pattern (Tomck et al., 1981). Although current supply and demand determine equilibrium price, expectation concerning supply and demand conditions in the future also result in seasonal price fluctuations (Dereje et al., 2001). The demand for sweet potato in the study area is influenced by the price of other cereal crops, such as maize and tef. Other factors which influence demand for sweet potato include season or time of sweet potato supply, and quality or taste of sweet potato varieties supplied to the market. Because of the above, the price of sweet potato varies from time to time.

It is recommended that the demand for sweet potato should be created in large cities, like Addis Ababa and regional capitals through improved post-harvest techniques, using better storage and processing methods. In this regard, the establishment of micro-cottage sweet potato processing industries, which can convert sweet potato
into different value-added food products, such as carbonated drinks, confectionaries, etc., should be encouraged. Furthermore, by strengthening the research and extension system, and diversifying the eating habit of the community we can enhance the demand for sweet potato in rural and urban areas.

6.1. Analysis of the Impact of Improved Sweet Potato at Farm Level

Among the specific benefits obtained from the adoption of improved sweet potato varieties, the most important were the betterment of household food security status and annual income. The results of the formal survey are almost the same with that obtained from interviewing key informants regarding sweet potato agronomic practices, such as planting time, frequency of weeding, harvesting time and method and storage. Hence, the results of the formal survey were not explained for each agronomic practice here and one can refer to the results of key informant interviews presented earlier.

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Adopters</th>
<th>Non Adopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>Improved Variety</td>
<td>Local Variety</td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>3610.00</td>
<td>441.00</td>
</tr>
<tr>
<td>Gross benefit (Birr/ha)</td>
<td>6498.00</td>
<td>794.00</td>
</tr>
<tr>
<td>Fertilizer and its application (Birr/ha)</td>
<td>90.22</td>
<td>-</td>
</tr>
<tr>
<td>Total cost that vary (birr/ha)</td>
<td>90.22</td>
<td>-</td>
</tr>
<tr>
<td>Net benefit (Birr/ha)</td>
<td>6407.78</td>
<td>794.00</td>
</tr>
</tbody>
</table>

Table 1 depicts the partial budget for farmers using improved sweet potato varieties. Those farmers using fertilizer and improved variety gained a net benefit of 6407.78 birr/ha, while farmers using local variety obtained a net benefit of 794.00 birr/ha. If we consider the planting material of 55,555 cuttings/ha, the cost of production would be 613 birr/ha whereas the net benefits received from improved and local varieties are 5794.78 birr/ha and 181 birr/ha and the cost of production would be 703.22 and 613 birr/ha, respectively.
7. CONCLUSION AND IMPLICATIONS

The results of the informal and formal survey conducted in the study areas indicated that about 93 per cent of the sample farmers adopted the improved varieties, namely Gadissa (Awassa 83) and Ogan segan. All other officially released varieties were not accepted or adopted by farmers in the study areas because of various reasons. Some of the reasons were poor performance of the varieties under farmers' condition, low productivity and poor resistance to sweet potato butterfly. The results of key informant interviews and questionnaire survey confirmed that sweet potato butterfly is the number one problem that researchers need to study in their future breeding program.

The study also confirmed that farmers-to-farmers technology transfer is the most important means of technology dissemination in all areas. This indicates that if a given technology is appropriate and accepted by some groups of farmers it can be easily transferred to others also.

The adoption of improved sweet potato varieties, such as Gadissa and Ogan Segan, significantly improved household food security status and income level in all the surveyed areas. Some of the specific impact indicators identified were improvement in housing type (from thatched to iron roofed), increase in annual income, and ability to pay school fees.

The results of this study indicate that sweet potato is not an inferior good rather it is a normal good, having income elasticity greater than zero. Hence, household income has a positive and significant impact on sweet potato consumption expenditure. In addition, the own price elasticity of sweet potato also confirmed that sweet potato is a normal good for rural households in contrast to our expectation. Some selected household characteristics were included for econometric estimation. Results from location dummies indicate that sweet potato consumption demand significantly vary across the three locations.

Econometric results across all the models indicate sweet potato consumption demand is negatively and significantly influenced by the age of household head, implying older farmers tend to have lower sweet potato consumption expenditure. This could be associated with the cultural stigma (problem of impotence), older family
members attach to sweet potato consumption. They consider sweet potato as children’s food. The other explanation could be that older farmers are sceptical to adopt new technologies. As a result, they may not be benefited from the extra yield obtained from the newly released sweet potato varieties in the study areas. Hence, better training and extension advice is of paramount importance in popularizing the newly released varieties.

Household’s proximity to marketplaces, measured in km, positively and significantly increases sweet potato consumption demand. A 1% decrease in the average distance results in 11% increase in sweet potato consumption demand. Thus, households closer to marketplaces have higher sweet potato consumption expenditure or allocate more of their budget for sweet potato. This is because households with better access to the market have relatively better price incentives for sweet potato production. Hence, more production leads to relatively more consumption level. This is because production and consumption decisions are often non-separable in many rural and developing economies. Moreover, improvement in market infrastructure, as well as creation of new marketplaces, could be one way of increasing sweet potato production and consumption decisions of households in the study areas.

The results of econometrics estimation indicate that a 1% increase in livestock number per household results in 48% increase in sweet potato consumption demand. This indicates households with large number of livestock have a higher elasticity of expenditure for sweet potato. One explanation could be animal products, such as milk, cheese, egg and the like, often consumed in combination with sweet potato in many households who own livestock. Furthermore, animal products are expected to be better complements for sweet potato consumption although cross price elasticity was not computed for these products due to the cross sectional nature of the data, i.e., lack of price variability across locations.

The variable—cultivated land per family size—was found to have extremely higher impact on sweet potato consumption expenditure. A 1% increase in landman ratio, results in about 604% increase in sweet potato consumption expenditure, indicating that shortage of land is detrimental for sweet potato production and consumption decisions.
The use of improved sweet potato varieties results in increase of farmers' production of sweet potato and, hence, boosts their incomes. As a result, adopters of improved sweet potato are encouraged to use the potato varieties. The economic analysis, using the partial budgeting method of the adopted improved sweet potato varieties, also confirmed its profitability.

Hence, policy makers should look closely on those factors which have greater implications on rural households' food demand and design better agricultural market policies to enhance commercialisation of agricultural technologies.
Impact of Sweet Potato Production Technologies to Enhance Commercialisation of ...

References


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Annex 1. Definition of Variables Hypothesized and Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables &amp; expected sign</th>
<th>Definition of variables</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spconsum</td>
<td>Dependent variable, amount of sweet potato consumed in Birr per annum</td>
<td>132.75</td>
<td>219.95</td>
</tr>
<tr>
<td>ifconsum</td>
<td>Dependent variable for Probit (yes=1)</td>
<td>0.72049</td>
<td>0.45015</td>
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<tr>
<td>Age (±)</td>
<td>Age of household head</td>
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<td>12.9760</td>
</tr>
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<td>Educ (+)</td>
<td>Household education (Literate=1)</td>
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<td>Location2 (+)</td>
<td>Location2=Wolaita Zone</td>
<td>0.5125</td>
<td>0.5013</td>
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<tr>
<td>Location3 (+)</td>
<td>Location3= kembata-Tembaro Zone</td>
<td>0.2375</td>
<td>0.4259</td>
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<tr>
<td>Distda (-)</td>
<td>Distance from development agent centre (in km)</td>
<td>3.689006</td>
<td>3.269282</td>
</tr>
<tr>
<td>Distmkt (+)</td>
<td>Distance from the nearest market place (in km)</td>
<td>4.725652</td>
<td>3.518967</td>
</tr>
<tr>
<td>Femlab (?)</td>
<td>Adult female labour available</td>
<td>3.898012</td>
<td>3.711411</td>
</tr>
<tr>
<td>Malelab (?)</td>
<td>Adult male labour available</td>
<td>3.915335</td>
<td>3.464013</td>
</tr>
<tr>
<td>Ifoffarm2 (+)</td>
<td>If off farm income available (Yes=1)</td>
<td>0.2236025</td>
<td>0.4179587</td>
</tr>
<tr>
<td>Oxlandrt (-)</td>
<td>The ratio of oxen to cultivated land</td>
<td>1.645932</td>
<td>1.919428</td>
</tr>
<tr>
<td>Livstown (+)</td>
<td>Total number of livestock in TLU</td>
<td>2.368012</td>
<td>1.919428</td>
</tr>
<tr>
<td>Lspressu (-)</td>
<td>Number of Livestock per cultivated land</td>
<td>3.628917</td>
<td>2.786751</td>
</tr>
<tr>
<td>Cwratio (+)</td>
<td>Consumer worker ratio</td>
<td>1.160015</td>
<td>1.160015</td>
</tr>
<tr>
<td>Shadowwp (-)</td>
<td>Shadow price of sweet potato valued in birr (equilibrium b/n production and consumption)</td>
<td>93.87267</td>
<td>201.5125</td>
</tr>
<tr>
<td>Fullincm (-)</td>
<td>Full income in birr (shadow price* sweet potato production)</td>
<td>588.9336</td>
<td>2320.727</td>
</tr>
<tr>
<td>Mzconsu (-)</td>
<td>Amount of maize consumed valued in Birr per year</td>
<td>336.7081</td>
<td>426.6408</td>
</tr>
<tr>
<td>Landman (-)</td>
<td>Cultivated land to total family size</td>
<td>0.1156844</td>
<td>0.1368033</td>
</tr>
<tr>
<td>Radio2 (?)</td>
<td>If the farmer has price information or possess radio</td>
<td>0.2981366</td>
<td>0.4588671</td>
</tr>
<tr>
<td>Training2 (+)</td>
<td>If the farmer attained training</td>
<td>0.2484472</td>
<td>0.4334607</td>
</tr>
</tbody>
</table>
## Annex 2. The Maximum Likelihood Estimates of the Probit Model

| Impspuse       | Coef.     | Robust Std. Err. | z       | P>|z|   | [95% Conf. Interval] |
|----------------|-----------|------------------|---------|-------|----------------------|
| Age            | -.058093  | .0186373         | -3.12   | 0.002*** | -.0946214 -.0215645 |
| educ           | .7611304  | .6235465         | 1.22    | 0.222   | -.4609983 1.983259   |
| distda         | -.0231764 | .0589791         | -0.39   | 0.694   | -.1387733 .0924204  |
| distmkt        | -.1710172 | .067535          | -2.53   | 0.011*** | -.3033833 -.0386511 |
| femlab         | .0935523  | .0689103         | 1.36    | .175    | -.0415094 .2286141  |
| Malelab        | .2095414  | .1233829         | 1.70    | 0.089*  | -.0322847 .4513674  |
| Offincom       | -.0025259 | .0006433         | -3.93   | 0.000*** | -.0037867 -.001265  |
| oxlandrt       | .7077697  | .1797696         | 3.94    | 0.000*** | .3554278 1.644076   |
| livstown       | .9991268  | .3290619         | 3.04    | 0.002*** | .3541774 1.644076   |
| livstpress     | -.9137716 | .1994846         | -4.58   | 0.000*** | -1.304754 -.522789  |
| cwratio        | .8645072  | .4156425         | 2.08    | 0.038*  | .0498628 1.679152   |
| Farmincome     | .0012885  | .0005143         | 2.51    | 0.012** | .0002806 -.00022964 |
| mzconsu        | -.0012942 | .0005328         | -2.43   | 0.015** | -.0023384 -.00025   |
| landman        | -4.35053  | 3.132436         | -1.39   | 0.165   | -10.48999 1.788932  |
| radio2         | 1.497059  | .5413242         | 2.77    | 0.006*** | .4360835 2.558035   |
| training2      | -.4053217 | .4582245         | -0.88   | .376    | -1.303425 .4927818  |
| Extcontct2     | .3111669  | .9183937         | 0.34    | 0.735   | -1.488852 2.111185  |
| cons           | 3.831046  | 1.424995         | 2.69    | 0.007*** | 1.038107 6.623985   |

**, **, * Significant at 1%, 5%, and 10% levels, respectively.
### Impact of Sweet Potato Production Technologies to Enhance Commercialisation of ...

**Annex 3. The Maximum Likelihood Estimates of the Probit Model**

| Coef       | Robust Std. Err. | P>|z| |
|------------|------------------|----------|
| age        | -0.0192035       | 0.0097938 | 0.050** |
| educ       | 0.5520081        | 0.3237167 | 0.088*  |
| location2  | 1.283258         | 0.3544369 | 0.000***|
| location3  | 0.6389963        | 0.3782005 | 0.091*  |
| distda     | -0.0079487       | 0.0426151 | 0.852   |
| distmkt    | -0.1227126       | 0.381881  | 0.001***|
| femlab     | 0.0198672        | 0.046377  | 0.668   |
| malelab    | 0.0220655        | 0.0502561 | 0.661   |
| ifoffarm2  | 1.08802          | 0.4028911 | 0.007***|
| oxlandrt   | 0.0331424        | 0.0864302 | 0.701   |
| livestown  | 0.1344397        | 0.1281859 | 0.294   |
| livstpress | -0.0520374       | 0.0871687 | 0.551   |
| cwratio    | 0.0143747        | 0.2288268 | 0.950   |
| shadowwp   | -0.0011616       | 0.0017421 | 0.505   |
| fullincm   | 0.0001618        | 0.0002104 | 0.442   |
| mzconsu    | 0.0003684        | 0.0004395 | 0.402   |
| landman    | 3.24579          | 1.776598  | 0.068*  |
| radio2     | -0.4509194       | 0.256827  | 0.114   |
| training2  | 0.4970253        | 0.3165035 | 0.116   |
| cons       | 0.0520242        | 0.7969812 | 0.948   |

**Probit estimates**

- Number of obs = 161
- Wald chi2 (18) = 43.69
- Prob > chi2 = 0.0006
- Pseudo R2 = 0.3309

Log pseudo-likelihood = -63.822172

***, **, * Significant at 1%, 5%, and 10% levels, respectively.
## Annex 4. The Maximum Likelihood Estimates of Tobit Model

| Coef.  | Std. Err. | P>|z| |
|--------|-----------|-----|
| age    | -3.079526 | 1.440996 | 0.034** |
| educ   | 59.91222  | 43.30643 | 0.169 |
| location2 | 184.7369 | 45.10234 | 0.000*** |
| location3 | 132.0881 | 51.30865 | 0.011*** |
| distda | -3.008938 | 5.518799 | 0.586 |
| distmktd | -11.45279 | 5.267106 | 0.031** |
| famlab | 11.38921  | 6.11878  | 0.065* |
| malelab | 6.982965  | 6.408087 | 0.278 |
| ifoffarm2 | 41.63385 | 40.21486 | 0.302 |
| oklandrt | 15.06535 | 11.51181 | 0.193 |
| livstown | 61.04958  | 12.52158 | 0.000*** |
| livstpress | -25.36201 | 10.81671 | 0.020** |
| cvratio | 28.83773  | 24.26401 | 0.237 |
| shadowp | -0.8998319 | 0.1526603 | 0.000*** |
| nzconsu | 0.0619313  | 0.0126026 | 0.000*** |
| landman | 604.0633  | 133.1319 | 0.000*** |
| radio2 | 17.60828  | 37.79645 | 0.642 |
| training2 | 14.71477 | 36.71102 | 0.689 |
| cons   | -134.9724 | 99.77816 | 0.178 |

Number of obs. = 160, Prob > chi2 = 0.0000, Pseudo R2 = 0.0673, Log Likelihood = -788.56254

### ** * * Significant at 1%, 5%, and 10% levels, respectively.

## Annex 5. Marginal Effect of a Change in Explanatory Variables on the Decision to Consume Sweet Potato

| Coef.  | DF/dx | Robust Std. Err. | P>|z| |
|--------|-------|------------------|-----|
| age    | -0.0049183 | 0.0025142 | 0.050** |
| educ*  | 0.1570249  | 0.1017682 | 0.088* |
| location2* | 0.3297296 | 0.0928041 | 0.000*** |
| location3* | 0.1383036 | 0.0700196 | 0.091* |
| distda | -0.0020358 | 0.0109382 | 0.852 |
| distmktd | -0.0314286 | 0.0097533 | 0.001*** |
| feinclab | 0.0050883  | 0.011888  | 0.668 |
| malelab | 0.0056513  | 0.012859  | 0.661 |
| ifoffarm2* | 0.2042738 | 0.0548876 | 0.007*** |
| oklandrt | 0.0084883  | 0.0221294 | 0.701 |
| livstown | 0.0344321  | 0.0330344 | 0.294 |
| livstpress | 0.0133276 | 0.0223413 | 0.551 |
| cvratio | 0.0036816  | 0.058598  | 0.950 |
| shadowp | -0.0002975 | 0.0004371 | 0.505 |
| fullincm | 0.0000414  | 0.0000526 | 0.442 |
| nzconsu | 0.0009944  | 0.001124  | 0.402 |
| landman | 0.8312971  | 0.4310813 | 0.068* |
| radio2** | -0.1249169 | 0.0862753 | 0.114 |
| training2* | 0.1125196 | 0.0604973 | 0.116 |

obs. P  = 71875
pred. P  = 8267694 (at x-bar)

(*) DF/dx is for discrete change of dummy variable from 0 to 1.

z and P>|z| are the test of the underlying coefficient being 0.
Annex 6. Marginal Effect of A Change in Explanatory Variables on the Level of Sweet Potato Demanded

| Spconsum  | Coef.    | Std. Err. | P>|t| |
|-----------|----------|-----------|----|
| age       | -3.079526| 1.440996  | 0.034** |
| educ      | 59.91222 | 43.30643  | 0.169 |
| location2 | 184.7369 | 45.10234  | 0.000***|
| location3 | 132.0881 | 51.30865  | 0.011***|
| distda    | -3.008938| 5.518799  | 0.586 |
| distmkt   | -11.45279| 5.267106  | 0.031** |
| femlab    | 11.38921 | 6.11878   | 0.065* |
| malelab   | 6.982965 | 6.408087  | 0.278 |
| ifoffarm2 | 41.63385 | 40.21486  | 0.302 |
| oxlandrt  | 15.06535 | 11.51181  | 0.193 |
| livstown  | 61.04958 | 12.52158  | 0.000***|
| livstpress| -25.36201| 10.81671  | 0.020** |
| cwratio   | 28.83773 | 24.26401  | 0.237 |
| shadowp   | -.8998319| .1526603  | 0.000***|
| fullincm  | .0619313 | .0126026  | 0.000***|
| mzconsu   | .0483524 | .0432455  | 0.265 |
| landman   | 604.0633 | 133.1319  | 0.000***|
| radio2’   | 17.60828 | 37.79645  | 0.642 |
| training2 | 14.71477 | 36.71102  | 0.689 |
| -cons     | -134.9724| 99.77816  | 0.178 |

Obs. summary = 45 left-censored observations at spconusm ≤ 0
           = 115 uncensored observations

***, **, * Significant at 1%, 5%, and 10% levels, respectively.
INFORMAL CHANNELS FOR TRANSFER AND ADOPTION OF IMPROVED TECHNOLOGIES: THE CASE OF SWEET POTATO VARIETIES IN BOLOSO SORE WOREDA, SOUTHERN ETHIOPIA

Endrias Geta*, Legesse Dadi** and Teressa Adugna+

Abstract

The success of any agricultural technology is judged ultimately by its acceptance and adoption by farmers. In Ethiopia, formal seed sector does supply certified seeds of field crops, such as cereals and pulses. Technology development and transfer of root crops is often weak. Sweet potato is widely grown and used as staple food in southern Ethiopia. Research efforts made so far came up with a number of improved varieties of the crop to be adopted by farmers. However, many of these improved varieties remained on the shelf rather than being used by farmers for production. On the other hand, some fortunate varieties of sweet potato were disseminated within the farming community at a faster rate and wider scale than even those crops supported by the formal seed sector. This study investigated alternative channels for transfer and adoption of sweet potato varieties and attributes of those varieties that promote transfer and adoption rate. The findings confirm the feasibility of disseminating technologies through informal sectors.

1. INTRODUCTION

Adoption of improved agricultural technologies is crucial to meet the increasing demand for food. Sweet potato is one of the highly productive crops and suitable to meet challenge of increasing food demand and declining land labour ratio. Application of modern technologies and management practices greatly enhanced productivity of sweet potato. However, the success of any agricultural technology is judged
ultimately by its acceptance and adoption by farmers (David 1997). Official seed sources or development projects are often important in launching varieties but may be relatively ineffective in reaching the mass of farmers, particularly the smallest and the most isolated (CIAT 1990; Sperling 1994). Efficacy of local seed systems in supplying seed of local and improved crop varieties has been reported (David and Sperling 1999). It is further indicated that local networks of exchange and gift played important role in seed dissemination.

This study investigated informal channels that enhanced improved sweet potato varieties transfer and adoption. Moreover, important attributes of sweet potato varieties in favour of adoption of improved sweet potato varieties were analyzed and discussed.

1.1. Overview of Sweet Potato Production in Ethiopia

Sweet potato is widely grown nearly in all countries found south of the Sahara; the number of African countries producing the crop exceeds that of any other continent (Scott et al., 1992). Its cultivation is more intensive, particularly in the highlands of east and central Africa, in a diverse set of environments located between 800 m and 1900 m above sea level (CIP 1991).

The exact time of introduction of sweet potato to Ethiopia is not clearly known. However, the crop has become popular particularly in densely populated areas of the South, South-western and Eastern parts of the country and remained an important food source among the communities (Endale et al., 1992). It is an important food crop and plays critical roles in rural diets. In some areas, it ameliorates food shortage instances when crops like maize are in short supply and in time of drought.

1.1.1. Extent of Sweet Potato Production In SNNPR

SNNPR is the leading producing region of sweet potato in Ethiopia. The total area under sweet potato at the time of the study was 23,643.84 hectares, having annual production of 236,288.3 tons (CSA 2002). Thus, sweet potatoes occupied 3% of crop area and contributed to 16% of the regional total volume of crop production. In Wolaita zone, sweet potato occupied 20% of cultivated area and accounted for 55%
of the total volume of crop production. In the study woreda, it covered 29% of cultivated area and contributed to 63% of total volume of crop production.

1.1.2. Improved Sweet Potato Varieties in the Study Area

In the study area, nine improved varieties of sweet potatoes were released for production (NSIA, 2001). Most of these varieties were released by the Awassa and Areka research centres. These varieties are suitable for low to mid altitude areas (Assefa 2001). The varieties are grouped into: early maturing (90-120 days), medium maturing (120-150 days) and late maturing (150-180 days) depending on their maturity period. The yield potential of early, medium and late maturing varieties range between 17-24, 31-35 and 37-40 tons per hectare, respectively.

2. METHODOLOGY

2.1. Description of the Study Area

The study was conducted in Boloso Sore woreda, located at about 420 km from Addis Ababa in Wolaita Zone, SNNPR. Boloso Sore woreda is connected to Wolaita Sodo town by a 30 km all-weather road. The total area of the woreda is about 57,128 hectares of which 42,670 (75%) hectares are cultivated. The soils in the woreda vary from place to place but nitosols are common. The area receives an annual rainfall of 1,578 mm and the mean maximum and minimum daily temperature are 25.4°C and 13.4°C, respectively. The altitude of the study area ranges from 1,350 to 2,380 meters above sea level. The total population of the woreda is estimated to be 305,409, of which 139,060 and 166,349 are male and female, respectively (CSA 1996).

2.2. Data Collection and Analytical Techniques

The data for this study were collected from randomly selected sample farmers. A multistage random sampling method was employed to identify sample farmers. Initially, Peasant Associations (PAs), where promotion activities were undertaken, were listed in consultation with the woreda office of agriculture. From a list of PAs, six PAs were randomly selected. All farmers growing sweet potato were listed at each
sample PA in consultation with PA leaders and key informants. Finally, a total of 120 farmers were randomly selected using a probability proportional to size. The data were collected from October to November 2002 using structured questionnaire. Primary data were also supplemented with secondary data collected from different institutions.

Descriptive statistics, such as mean, per cent, and standard deviations, were used to characterize the farming system of the study area and assess seed dissemination channels. Limited dependent variable model provides a good framework to study adoption behaviour of farmers. The most commonly used qualitative models to study the adoption behaviour are the logit and the probit models (Feder et al., 1985). These models specify a functional relationship between the probability of adoption and various explanatory variables (Bekele et al., 2000). These models have been used in various adoption studies like those conducted by Yohannes et al. 1990, Mulugeta 1995 and Chilot et al. 1996. These models explain only the probability of adoption, but do not take into account the intensity of adoption. Data on intensity of adoption take on values zero and greater than zero. Tobit model is appropriate to deal with such data (Tobin 1968; McDonald and Moffit 1980). In this study, Tobit model was used to examine factors affecting adoption and intensity of use of improved sweet potato varieties. The Tobit model measures not only the probability that a farmer will adopt the new variety, but also the intensity of use of the technology once adopted. The Tobit model is expressed as,

\[
Y_i = \beta_i X_i + U_i, \text{ if } \beta_i X_i + U_i > 0 \\
= 0, \text{ otherwise}
\]

Where \( Y_i \) = proportion of area under improved sweet potato varieties in the total sweet potato area

\( X_i \) = explanatory variable

\( \beta_i \) = a Kx1 matrix of parameters to estimated

\( U_i \) = normally distributed error term with mean zero and constant variance

The maximum likelihood method was used to estimate the parameters of the model.
Following Madalla (1983), the estimates of marginal effects of explanatory variables on the expected value of the dependent variable are given by,

$$\frac{\partial E(Y)}{\partial X_i} = F(z)\beta$$

(2)

Where, $z = \frac{X\beta}{\sigma}$, $F(z)$ is the cumulative distribution function, $z$ is the z-score for the area under normal curve and $\beta$ is the vector of Tobit maximum likelihood estimates.

The effects of explanatory variables can be decomposed into adoption and intensity effects (McDonald and Moffit 1980). Thus, a change in the probability of adopting improved sweet potato variety as dependent variable $X_i$ changes is estimated by,

$$\frac{\partial F(z)}{\partial X_i} = F(z)\frac{\beta_i}{\sigma}$$

(3)

Similarly, the change in intensity of adoption with respect to change in an explanatory variable among adopters is estimated by,

$$\frac{\partial E(Y_i|Y_i > 0)}{\partial X_i} = \beta \left[ 1 - z \frac{f(z)}{F(z)} - \left( \frac{f(z)}{F(z)} \right)^2 \right]$$

(4)

2.3. Variable Specification and Hypothesis

The model discussed above suggests that many important hypotheses related to adoption of improved sweet potato varieties include farm, farmer and technology specific characteristics. The model assumes that the dependent variable, which is defined as the proportion of the area under improved sweet potato varieties in the total sweet potato area, depends on the following explanatory variables.

Education: Education enables farmers to have access to new information and idea. It is hypothesized that education of household head has a positive impact on adoption of improved varieties.
Gender: Male farmers have more access to information than female household heads. Doss and Morris (2001) confirmed that women farmers tend to adopt improved technologies at a lower rate than men farmers because of limited access to information and resources. It is, therefore, hypothesized that gender of farmer being male has a positive influence on the adoption and intensity of use of improved sweet potato varieties.

Experience: Experience improves the technical and managerial skill of the individual farmer. Thus, farmer’s experience of growing sweet potato is related to his/her ability to obtain, process and use information relevant to its cultivation. Therefore, a positive relationship between experience and the probability of adoption and intensity of use of improved sweet potato varieties is hypothesized.

Labour: Human labour is a key input of agricultural production, particularly in hoe culture. Sweet potato production requires more labour as compared to cereals production. In the study area, large family size is common. This implies that labour is available for different farm activities. Thus, a household with larger family size (i.e., more labour in terms of man-equivalent) is expected to adopt new sweet potato varieties more compared to a household with small family size.

Off-farm activity: Off-farm employment takes away labour from farm operation. This would reduce the amount of labour available for farm activities. Thus, involvement in the off-farm activity is likely to be negatively related to the adoption and intensity of use of improved varieties of sweet potato.

Farm size: Regarding the relationship between farm size and adoption of improved technologies, there are two schools of thought. One argues that the variable has a positive influence on adoption of the technologies as farmers with large farms generate more income, which provides a better capital base and enhances risk bearing ability (Shiyani et al., 2000). Another argument advocates that small-sized farms try to utilize their limited resources more efficiently and thus adopt new technologies at a faster rate (Barker and Herdt 1978; Ahmed 1981; Allauddin and Tisdell 1988). In the present study, the latter argument is hypothesized since there is a probability that smaller farms adopt improved sweet potato varieties than looking for more profitable and risky enterprises, such as cereals as compared to larger farms. So, a negative relationship is expected between farm size and adoption and intensity of use of improved varieties of sweet potato.
Livestock Ownership: Livestock ownership is a key indicator of wealth. Farmers with large number of livestock are wealthy, and this wealth is measured in terms of money value at the prevailing market price. The value of livestock owned is expected to have a positive effect on adoption and intensity of use of improved sweet potato varieties.

Variety characteristics: Farmers' perception of different characteristics of technology, such as yield, maturity period, colour, and establishment ability determine farmers' decision to adopt a technology. Nigatu and Parikh (1999) found out, that farmers' perception of different characteristics of modern variety has a highly significant effect on adoption. Thus, farmers' perception about the characteristics of improved varieties is expected to have positive effect on adoption and intensity of use of improved varieties.

Extension: Extension creates awareness about new technologies. The higher the frequency of extension contact, the more likely the farmer will receive valuable information about these technologies. A positive relationship is, thus, hypothesized between the variable—extension contact—and adoption and intensity of use of improved sweet potato varieties.

Distance to research centre: The relationship between adoption and distance to the research centre is based on the idea that those farmers nearer to the research centre have better access to improved technologies. Hence, an increase in distance from the research centre to a farm is likely to have a negative effect on the adoption and intensity of use of improved sweet potato varieties.

Distance to market centre: There seems to be limited opportunity of marketing of sweet potato product because it is easily perishable and not suitable to transport over long distances because of its bulky size. Hence, distance from the farm to marketplace is negatively related to the adoption and intensity of use of improved sweet potato varieties. The list of explanatory variables used in the model and their expected signs are summarized in Table 1.
Endrias Geta, Legesse Dadi, and Teressa Adugna

Table 1. Explanatory Variable Used in the Tobit Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Expected Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Education of the household head in years of schooling</td>
<td>+</td>
</tr>
<tr>
<td>Gender</td>
<td>Gender of the household head (0=female, 1=male)</td>
<td>+</td>
</tr>
<tr>
<td>Off-farm</td>
<td>Involvement in off-farm activity</td>
<td>-</td>
</tr>
<tr>
<td>Experience</td>
<td>Farming experience of the household head in years</td>
<td>+</td>
</tr>
<tr>
<td>Labour</td>
<td>Labour available for field work in man equivalent</td>
<td>+</td>
</tr>
<tr>
<td>Farm Size</td>
<td>Total farm size in hectares</td>
<td>-</td>
</tr>
<tr>
<td>Livestock Ownership</td>
<td>Monetary value of livestock owned</td>
<td>+</td>
</tr>
<tr>
<td>Yield Potential</td>
<td>Farmers' perception of yield (0=not superior, 1=superior)</td>
<td>+</td>
</tr>
<tr>
<td>Maturity Period</td>
<td>Farmers' perception of maturity of improved varieties</td>
<td>+</td>
</tr>
<tr>
<td>(0=not early maturing, 1=early maturing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colour of tubers</td>
<td>Farmers' perception of colour of tuber of improved varieties (0=not preferred, 1=preferred)</td>
<td>+</td>
</tr>
<tr>
<td>Establishment</td>
<td>Farmers' perception of establishment performance of improved varieties (0=not better, 1=better)</td>
<td>+</td>
</tr>
<tr>
<td>performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>Extension contact (0=no, 1=yes)</td>
<td>+</td>
</tr>
<tr>
<td>Distance from research centre</td>
<td>Distance to research centre in kilometres</td>
<td>-</td>
</tr>
<tr>
<td>Distance from market</td>
<td>Distance to market centre in kilometres</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Own explanation.

3. RESULTS AND DISCUSSION

3.1. Socioeconomic Characteristics

The average family size of a sample farm household was estimated to be 7.2. The minimum and maximum family sizes were found to be 2 and 15, respectively. Age of household heads ranges between 19 and 75 years. However, greater proportion of adopters of improved sweet potato varieties were from middle age groups of 31-45 years (43.5%). The proportion of lower age group farmers, identified as adopters and non-adopters, was 18% and 14.2%, respectively. About 64.3% of the non-adopters were from the age group greater than 45. Mean number of year of farming experience
Informal Channels for Transfer and Adoption of Improved Technologies: The Case ...

was 22 with minimum of 2 and maximum of 55 years. About 57.1% and 42.9% of non-adopters and adopters, respectively, were illiterate. The average year of formal education of adopters and non-adopters was estimated to be 3.8 and 3.4, respectively.

Landholding was very small, averaging to about 0.7 hectare per household. The minimum and maximum landholdings were 0.06 hectare and 1.63 hectare, respectively. Farmers utilize their limited land for cultivating annual and perennial crops, grazing and planting trees. Of the average landholdings of sample households, 0.58 hectare was cultivated accounting for about 83.8% of the landholding per family. Annual crop cover of 56.6% of the landholdings and perennial crops, grazing land and trees in the decreasing order of importance cover the remaining 43.3%.

3.2. Farming System Characteristics

The farming system of the study area is characterized by subsistence mixed farming system of crop and livestock production. The major crops produced are *enset*, sweet potato, maize, *tef*, wheat, haricot bean, sorghum, yam and taro. Cattle, donkey, sheep, goats and poultry are also raised on-farm.

3.2.1. Cropping Sub-System

With so many crops, the cropping sub-system of the study area is complex and farmers are continuously engaged in land preparation, planting, weeding or harvesting of different crops. However, planting and weeding of different crops largely depend on the onset of rainfall. There are two main cropping seasons: *belg* and *meher* in the study area. The *belg* season begins from late February to late March/early April where maize, haricot bean, *enset*, sweet potato and Irish potato are planted. The *meher* cropping season begins in late June and continues up to September. *Tef*, wheat, Irish potato, haricot bean and sweet potato are planted in the *meher* season. In addition, sweet potato is planted from late September to end of December after the *meher* rainfall by using residual moisture. Planting of sweet potato during this period is to fill the critical food shortage gap from May to July until green harvests of maize and haricot bean are ready for family consumption. Sweet potato production during this period also fetches higher prices as compared to sweet
production in other seasons and is exported to urban markets, like the Addis Ababa market.

Sweet potato is planted at three distinct planting times in a year: April-May, July-August and October-December. Sweet potato fields are ploughed two to three months before planting. Weeding is undertaken depending on the amount of rainfall, which creates favourable conditions for growth of weeds. The crop matures three to eight months after planting, depending on the variety and management.

Intercropping is practiced by 63.3% of the sample farmers. This practice allows for crop intensification both in time and place. It involves varying degree of interference between crop species. The crops usually intercropped in the study area are maize with haricot bean, maize with sweet potato and sorghum with haricot bean. In the study year, only 9.2% of sample farmers intercropped maize with sweet potato.

Crop rotation is carried out by 89.2% of sample farmers to improve and maintain soil fertility. The common crop rotation activities practiced by farmers are: maize-sweet potato-maize, maize-sweet potato-ef, tef-maize-haricot bean-ef.

Relay cropping\(^4\) is considered by 67.5% of sample farmers as a strategy for efficient utilization of land. Crops like haricot bean, tef and wheat are planted under maize before maize plant is harvested. About 27% of the farmers in the area use oxen plough for land preparation whereas the remaining 73% have no oxen and use hand hoe. For cultivation they use a sort of hoes locally named as tikiya and shalkuwa. Harvesting is done by sickle for cereal crops and by doma (hoe) for root crops.

Major crop production problems in the study area include land shortage, erratic rainfall distribution, pests and diseases, high cost and untimely delivery of fertilizer. Sweet potato butterfly is a major pest, constraining sweet potato production in the study area. Sweet potato butterfly regularly appeared in the past few years and affected sweet potato production. In an attempt to lessen the damage done by the butterfly, farmers spray cow dung, diluted in water, on vegetative part of the plant found above the ground. However, the traditional control measure is not effective according to farmers.

\(^4\) Relay cropping is introducing/planting additional crop(s) to the same field when the first crop reaches its maturity.
3.3. Sweet Potato Production, Storage and Marketing Practices

Sweet potatoes are grown under rain-fed condition in the study area. Farmers propagate sweet potatoes entirely by vine cuttings; top (apex) and middle cuttings are used. Vines are maintained on small plots of land usually under enset and coffee fields. Farmers either obtain vines from their own plots or procure from neighbours or local markets.

Sweet potato is planted on ridges. It is rarely planted on flat bed. Plant spacing, i.e., spacing within and between rows varies from place to place and from farmer to farmer. Most farmers use spacing of approximately 20 cm x 15 cm to 50 cm x 30 cm between rows and plants, respectively.

Farmers plant sweet potatoes in rows on ridges. This practice is in line with the research recommendation. However, they do not follow the “within and between” row spacing recommended by research. Farmers plant sweet potatoes starting belg season up to the cessation of meher rainfall i.e. three times in a year. This extended planting is not in line with research recommendation, which is June and October for main season and late main season, respectively, though it may include recommended planting times.

Farmers cut a single vine into two or three for rainy season planting and plant three vines per hill to assure establishment. The number of vine cuttings per hill is in line with research recommendation, i.e., two to three cuttings per hill. In late season planting, farmers bury the entire vine on ridge to minimize wilting due to lack of moisture. This is not advisable by research as it requires more planting materials and generates a number of plants that compete for space and nutrients and, hence, reduce yield. Sweet potatoes are weeded during the first two months after planting in the study area. Research findings confirmed this practice as sweet potatoes suppress weed growth after full ground cover.

In the study area, inorganic and organic (manure) fertilizers are not applied on sweet potato. However, 175kg DAP during planting and 80kg Urea four weeks after planting are recommended by research.
Sweet potatoes are highly perishable and are seldom stored for a long period after harvest. Once harvested, most of the tubers are immediately consumed or sold. However, some farmers store sweet potato for future sale or consumption for a period of up to 12 months by postponing harvest time.

Most of the sweet potato growers sell part of their produce in local markets. Relatively rich farmers sell their crop on the field to traders who harvest, pack up and transport it to markets. The main channel of sweet potato marketing in the area is 'producer-assembler-consumer.' The fact that tubers are easily perishable, storage problems and high transport cost are the major marketing problems of sweet potato in the study area.

3.4. Adoption and Intensity of Use of Improved Sweet Potato Varieties

About four varieties of sweet potato are under production in the study area. These include Erbo (local), Wolaita shukaria (local), Ogan Sangan (improved) and Awassa-83 (improved). However, other varieties released by research are not under production. About 88.3% of sample farmers were found to be adopters of improved sweet potato varieties.

3.4.1. Sweet Potato Varieties Transfer Channels

Two recognized technology transfer channels exist in the study area—formal and informal. Formal technology transfer channel involves local government administration units and agricultural development offices as major agents. This channel mainly focuses on delivery of improved technologies and associated inputs of cereal and pulse crops.

The informal technology transfer channels identified in the study area include local market centres, neighbours and relatives elsewhere. More than 71% of sweet potato growers in the study area obtained improved sweet potato varieties using either of these informal channels (Table 2 and Figure 1). Once the win-win variety is introduced in a given locality, it goes on diffusing by itself without the involvement of extension agents. For example, the variety Awassa-83, locally named as Gadissa, is widely accepted and produced by all adopters of improved varieties in the area. This
implies that attributes of a variety play a vital role in transfer and adoption of improved varieties of sweet potato. Only 29.2% of adopters of improved sweet potato variety obtained the variety from the formal seed source, i.e., bureau of agriculture. Majority of the adopters of improved sweet potato variety obtained the variety from informal sources. Neighbour-to-neighbour variety transfer accounted for the highest percentage (41.5%) of transfer channels for adoption of improved varieties.

<table>
<thead>
<tr>
<th>Source</th>
<th>Non Adopters</th>
<th></th>
<th>Adopters</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per cent</td>
<td>Number</td>
<td>Per cent</td>
</tr>
<tr>
<td>Bureau of agriculture</td>
<td>2</td>
<td>22.2</td>
<td>31</td>
<td>29.2</td>
</tr>
<tr>
<td>Research centre</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>6.6</td>
</tr>
<tr>
<td>Market</td>
<td>2</td>
<td>22.2</td>
<td>19</td>
<td>17.9</td>
</tr>
<tr>
<td>Neighbours</td>
<td>4</td>
<td>44.4</td>
<td>44</td>
<td>41.5</td>
</tr>
<tr>
<td>Relative</td>
<td>1</td>
<td>11.1</td>
<td>5</td>
<td>4.7</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>100</td>
<td>106</td>
<td>100</td>
</tr>
</tbody>
</table>

*Source:* Household survey data.
Figure 1: Adoption Levels of Improved Sweet Potato Varieties Obtained from Different sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Non Adopters</th>
<th>Adopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOA</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Research center</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Market</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Neighbor</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Relative elsewhere</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: Household survey data.

3.4.2. Factors Affecting Adoption and Intensity of Use of Improved Sweet Potato Varieties Transfer Channels

Among the variables included in the Tobit model, farm size, extension contact and distance from farm to research centre were highly significant (Table 3). There was a positive relationship between perceived attributes of improved varieties and its adoption and intensity of use. Farmers' perception of yield performance of improved varieties significantly affected the adoption and intensity of use of improved sweet potato varieties at 10% significance level. The variables representing farmers' perception of maturity period and establishment performance of improved varieties
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were significant at 5% significance level. Thus, farmers' perception of earliness of a variety and its better establishment performance affect the adoption and intensity of use of improved sweet potato varieties. These results are in conformity with the findings of Adesina and Zinnah (1993) in Sierra Leone.

Table 3. Estimated Results Using Tobit Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.23090</td>
<td>0.1966</td>
<td>1.175</td>
</tr>
<tr>
<td>EDU</td>
<td>0.00899</td>
<td>0.0074</td>
<td>1.209</td>
</tr>
<tr>
<td>GENDER</td>
<td>-0.04321</td>
<td>0.1454</td>
<td>-0.297</td>
</tr>
<tr>
<td>OFFFARM</td>
<td>0.01426</td>
<td>0.0178</td>
<td>0.800</td>
</tr>
<tr>
<td>EXPR</td>
<td>0.00527</td>
<td>0.0025</td>
<td>2.081**</td>
</tr>
<tr>
<td>LABOUR</td>
<td>-0.01365</td>
<td>0.0479</td>
<td>-0.285</td>
</tr>
<tr>
<td>FARMSIZE</td>
<td>-0.31255</td>
<td>0.0691</td>
<td>-4.527***</td>
</tr>
<tr>
<td>VALUES</td>
<td>0.00005</td>
<td>0.0000</td>
<td>1.722*</td>
</tr>
<tr>
<td>YIELDP</td>
<td>0.30310</td>
<td>0.1629</td>
<td>1.850*</td>
</tr>
<tr>
<td>MATUREP</td>
<td>0.13930</td>
<td>0.0666</td>
<td>2.322**</td>
</tr>
<tr>
<td>COLOURP</td>
<td>0.03480</td>
<td>0.0531</td>
<td>0.655</td>
</tr>
<tr>
<td>ESTABLP</td>
<td>0.10760</td>
<td>0.0549</td>
<td>1.961**</td>
</tr>
<tr>
<td>EXTN</td>
<td>0.19880</td>
<td>0.5243</td>
<td>3.785***</td>
</tr>
<tr>
<td>DISTRC</td>
<td>-0.00732</td>
<td>0.0024</td>
<td>-3.069***</td>
</tr>
<tr>
<td>DISTMKTC</td>
<td>0.00198</td>
<td>0.0101</td>
<td>0.196</td>
</tr>
<tr>
<td>Sigma</td>
<td>0.24000</td>
<td>0.0162</td>
<td></td>
</tr>
</tbody>
</table>

Log likelihood function: -6.107, F(z) = 0.9963, Z = 2.68

***, ** and * represent significance at 0.01, 0.05 and 0.10 levels, respectively.

Source: Household survey data.

Farm size was negatively related with the adoption of improved sweet potato varieties and its coefficient was significantly different from zero. The result is in line with the hypothesis that small farmers replace local varieties with new varieties at a faster rate, if additional gains are substantial. Most of the farmers in the study area have landholdings of less than one hectare. This group of farmers is poorer as compared to those few farmers cultivating cereals, such as tef, wheat and maize that generate higher cash income. Moreover, small farmers look for the best alternatives to secure food supply from their small landholdings. Shiyani et al. (2000), who studied the adoption of improved chickpea varieties in tribal region of Gujarati, India, reported similar trend. Extension contact was highly significant and positively related with the adoption of improved sweet potato varieties. This suggests that wider extension coverage would hasten the adoption of improved varieties of sweet potato.
Distance from farmer’s house to the research centre was negatively related to the adoption of improved sweet potato varieties. This indicates that farmers closer to the research centre are likely to have more awareness and have access to the new sweet potato varieties than those who are far away from research centres. This suggests increasing farmers' participation in technology generation and dissemination enhances the adoption and intensity of use of improved varieties.

3.4.3. Sensitivity Analysis

Using a decomposition procedure suggested by McDonald and Moffitt (1980), the results of the Tobit model can be used to assess the effects of changes in explanatory variables into adoption and intensity effects (Table 4). The computed results indicate that an increase in farm size by one unit would decrease the probability of adoption and intensity of use of improved sweet potato varieties by about 0.21% and 0.30%, respectively.

Table 4. Effects of Changes in Explanatory Variables on Adoption and Intensity of Use

<table>
<thead>
<tr>
<th>Variable</th>
<th>Change in Probability of Adoption*</th>
<th>Change in Intensity of Use*</th>
<th>Total change</th>
</tr>
</thead>
<tbody>
<tr>
<td>FARMSIZE</td>
<td>-0.21220</td>
<td>-0.3033</td>
<td>-0.51550</td>
</tr>
<tr>
<td>YIELDP</td>
<td>0.20460</td>
<td>0.29240</td>
<td>0.49700</td>
</tr>
<tr>
<td>EXTN</td>
<td>0.13450</td>
<td>0.19300</td>
<td>0.32750</td>
</tr>
<tr>
<td>MATUREP</td>
<td>0.09460</td>
<td>0.018520</td>
<td>0.21960</td>
</tr>
<tr>
<td>ESTABLPH</td>
<td>0.07310</td>
<td>0.10440</td>
<td>0.17750</td>
</tr>
<tr>
<td>EXFR</td>
<td>0.00360</td>
<td>0.00500</td>
<td>0.00860</td>
</tr>
<tr>
<td>DISTRC</td>
<td>-0.00490</td>
<td>-0.00190</td>
<td>-0.00680</td>
</tr>
<tr>
<td>VALUES</td>
<td>0.00004</td>
<td>0.00005</td>
<td>0.00009</td>
</tr>
</tbody>
</table>

*Computed using mean values.

A change in the perception of the farmer on yields of improved variety to be higher than that of local variety (i.e. a change from 0 to 1) brings about 0.20% increase in the probability of adoption and 0.29% increase in the intensity of use of improved sweet potato varieties. If farming experience increases by one year, adoption and intensity of use of improved sweet potato varieties increase by about 0.005% and 0.009%, respectively.
4. CONCLUSION AND POLICY IMPLICATIONS

The farming system of Boloso Sore woreda is characterized by an integrated crop-livestock production system. An intensified and diversified production system is considered by farmers as a strategy to confront the problem of land scarcity and risks of crop failure. The fact that a large number of crops are grown and animals are raised suggests that no single discipline/commodity-oriented research and development effort can improve the food security status of the area. Rather, an integrated approach, which involves various development partners and stakeholders, is a key factor to enhance the capacity of farmers in managing their own resources and overcome their difficulties. Institutional support including credit, marketing and extension services should be strengthened to lift up the utilization of the crop beyond family food insurance. Post-harvest loss of sweet potato is tremendous. Thus, research and extension should give due attention to post harvest technology generation and transfer. Such technologies are non-existent at present.

The study found out that farmer networks and local exchange mechanisms are important sources of improved sweet potato varieties for the majority of growers of sweet potato. This could be attributed to lack of continuous and formal seed multiplication and dissemination sectors. Moreover, the perishable and bulky nature of sweet potato contributes its share in enhancing local transfer mechanisms. It is, therefore, important to strengthen these informal networks by incorporating them in regular extension programmes to improve transfer and adoption of improved sweet potato varieties rather than focusing merely on formal distribution mechanisms.

Results suggest that farm size is negatively and significantly related to the adoption of improved sweet potato varieties. This implies that the varieties are more likely to be adopted and used by smallholder farmers. Thus, research and extension activities should concentrate on these small size farms than on relatively large farms for faster adoption and wider use of improved sweet potato varieties.

Extension contact has a strong and positive relationship with the adoption and intensity of use of improved sweet potato varieties. This indicates that extension coverage should be widened by establishing additional development centres and increasing the number of extension workers.
Distance from farmers' house to research centre has negatively and significantly influenced the probability of adoption and intensity of use of improved sweet potato varieties. Attention should, therefore, be given to set up sub-research centres and testing sites to improve farmers' access to improved varieties, and thereby increase the probability and rate of adoption of improved varieties of sweet potato.

Yield is one of the preferred traits/characteristics of the technology in influencing its adoption. This suggests that due attention should be given by researchers to improve the yield potential of existing and new varieties of sweet potato. The earliness in maturity of improved varieties is also an important character considered by farmers in their adoption decision. This preference emanates from farmers' attitude to avoid crop failure resulting from long maturity period and ensure food supply during transitory food insecure period in the year. Research efforts should, therefore, put emphasis on shortening maturity period of sweet potato varieties. Farmers' perception of the establishment performance of the varieties is another very important characteristic that fosters the adoption process of sweet potato varieties. Research and development activities should be geared towards generating sweet potato varieties that can easily be established using low soil moisture in dry months and resist moisture stress during time of drought.
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DETERMINANTS OF FERTILIZER ADOPTION IN ETHIOPIA: THE CASE OF MAJOR CEREAL PRODUCING AREAS

Techane Adugna¹, Mulat Demeke¹, Bezabih Emana²

Abstract

Imbalance between the population growth rate and the agricultural production growth rate is one of the pronounced national problems in Ethiopia. Low-level productivity, due to low level of improved technologies utilization and high risk due to adverse environment are among the most frequently mentioned major causes of the country’s chronic food security problem. In order to meet the food requirements of the growing population, food grains and other agricultural products have to be increased. The immediate available means to attain the national goal of food self-sufficiency is improving productivity through improved technologies. Fertilizer is one of the major productivity enhancing inputs. Therefore, the major concern of this study is to empirically examine factors influencing adoption and intensity of chemical fertilizer use by smallholder farmers in the major cereal producing areas of Ethiopia.

The data used for this study were extracted from the Fifth Round Ethiopian Rural Household Survey conducted by the Economics Department of Addis Ababa University, in collaboration with USAID in 1998/99. Tobit model was employed to analyze factors influencing adoption and intensity of fertilizer use among smallholder farmers. A total of sixteen explanatory variables were included in the model, of which 14 variables were found to be significant. Access to extension services, input credit, hired labour, availability of improved seeds and regional differentials are the most important factors influencing adoption and intensity of fertilizer use. Implications of this study are the need for strengthening of extension services, developing of human capital and improving farmers’ access to financial resource, which are important areas of priority for the success of future intervention strategies aimed at the promotion of production increasing technologies, such as chemical fertilizers.

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1. INTRODUCTION

Major economic and social measures have shown that agriculture is the dominant sector in the Ethiopian economy. In Ethiopia, economic development cannot be realized if proper attention is not given to the agriculture sector, which contributes 55% of GDP (at factor cost), 80% of employment opportunity, 60% of export earnings and 70% of raw materials for domestic industries (World Bank 1995).

Despite its highest share in the country’s economy, the performance of the agricultural sector is very poor. The land productivity is low with an average yield of 1.23 tons/ha for food grains (CSA 1998b). The sector is dominated by smallholder agriculture, which is characterized by the use of traditional technologies, poor resource base, and rain fed production system.

Food production in Ethiopia has failed to keep pace with population growth rate. Projections show that the population will continue to grow at a faster pace, and hence, contribute immensely to the severity of food deficit\(^1\). The need for rapidly increasing domestic food production is a matter of great urgency due to the fact that 50% of the population is already suffering from chronic food insecurity (World Bank 1995).

Measures to increase agricultural productivity in Ethiopia may be based on expanding cultivated area and/or increasing agricultural intensification. Agricultural intensification is the only short-term alternative of improving food availability in Ethiopia (Mulat et al., 1997). Fertilizer is one of the major productivity enhancing inputs. Hence, increased and efficient use of fertilizer can be considered as a more plausible alternative in Ethiopia to bridge the wide gap of food shortage (at least for the immediate future).

Considering its crucial role of raising agricultural productivity, greatest importance has been attached to chemical fertilizer and efforts have been underway to promote its adoption and use for over 30 years in Ethiopia. To speed up the development of the fertilizer sub-sector, the government has issued fertilizer policy, liberalized fertilizer market, deregulated fertilizer price and eliminated subsidy. In spite of all the

\(^1\) The average annual growth rate of agricultural output during 1980-1996 was 1.4%, while the average annual population growth rate, during the same period, was 2.7% (World Bank 1997, as cited by Bezabih 2000).
commendable policy reforms taken by the government, the response from the private traders is not as required due to various reasons.

More than 90 per cent of all the inorganic fertilizers is used by smallholder farmers and the remaining 10% is used by private commercial farms, state farms and research centres. Four regions alone (Oromia, Amhara, SNNPRS and Tigray) accounted for more than 90% of the total fertilizer consumption in the country. Of the total quantity of fertilizers consumed in the country, 94% was used for the production of major cereals, such as Teff (44%), Wheat (24%), Maize (12%), Barley (12%) and Sorghum (2%) (CSA 1998b).

Inorganic fertilizer consumption increased from 190,000 metric tons (Mt) in 1994 to 298,000Mt in 2000 and reached 323,000Mt in 2003/04. Although the total consumption of chemical fertilizers has shown an increasing trend, farmers in Ethiopia are still using very little due to various institutional, economic and physical factors. For instance, in the 1999/2000 production season, the average fertilizer consumption was about 35 kg per hectare for sites under major crops (or about 20 kg per hectare in nutrient term)². Out of the total area under major crops, only 26% received inorganic fertilizer and of the total farm households only 34% used chemical fertilizers (CSA 1998b).

Even though some fertilizer adoption studies were conducted in Ethiopia, the currently available data about the possible factors affecting adoption and intensity of fertilizer use are not sufficient. Hence, the present study is hoped to provide recent empirical evidences on factors influencing fertilizer adoption among smallholder farmers. The general objective of this study is to empirically examine factors influencing the adoption of chemical fertilizer by smallholder farmers in the major cereal producing areas of Ethiopia so as to propose some policy implications to be considered in future intervention strategies.

This paper is divided into four sections. The first section is "Introduction". It deals with the objective of the study and gives an overview of fertilizer use and policy in Ethiopia. Section two deals with research methodology. Results and discussion are

² Total area under major crops in 1999/2000 was 8.21 million hectares (CSA 2000) and the total quantity of fertilizer consumption, during the same period, was 290,264 MT (NFIA 2000).
detailed in Section three. Section four draws conclusions and suggests policy recommendations.

2. METHODOLOGY

2.1. Data Collection

The data used for this study were mainly obtained from the Fifth Round Ethiopian Rural Household Survey, conducted by the Economics Department of Addis Ababa University (AAU), in collaboration with the USAID. The data generated by the survey refer to the 1998/99 cropping season.

The survey covered 18 sites. They are found in the major fertilizer consuming regions of Ethiopia, namely Oromia, Amhara, SNNPRS and Tigray. A structured questionnaire was designed to collect a wide range of information regarding rural farm household. As this study is limited to the identification of determinants of the adoption and intensity of fertilizer use, an attempt was made to select the major cereal sites. Accordingly, sixteen sites, in which more than 50% of the farmers are engaged in the production of major cereals (Teff, Wheat, maize, Barley and Sorghum), were selected for this study. Seven sites are located in Oromia, four in Amhara, three in SNNPRS and two in Tigray. In total, 1482 farm households were covered by the study. The regional distribution of households is as follows: Oromia 625, Amhara 466, SNNPRS 241 and Tigray 150. After some critical analysis of the data, 1082 sample households were retained for final econometric analysis. Moreover, the field survey has been complemented with literature reviews on fertilizer adoption.

2.2. Method of Data Analysis

Farmers' adoption behaviour, especially in low-income countries, is influenced by a complex set of socio-economic, demographic, technical, institutional and biophysical factors (Feder et al., 1985). Modelling farmers' response to agricultural innovations has, therefore, become important, both theoretically and empirically.
Adoption studies based upon dichotomous regression models have attempted to explain only the probability of adoption versus non-adoption, rather than the extent and intensity of adoption. Knowledge of whether a farmer is using high yielding variety may not provide much information about a farmer’s behaviour because he/she may be using 1 per cent or 100 per cent of his/her farm for the new technology. Similarly, with respect to adoption of fertilizers, a farmer may be using a small/large amount per hectare area. A strictly dichotomous variable is often not sufficient for examining the extent and intensity of adoption for some problems in question, such as fertilizers (Feder et al., 1985). There is a broad class of models that have both discrete and continuous parts. One important model in this category is the Tobit. According to Adesina and Zinnah (1993), as cited by Shiyanne et al. (2000), the advantage of the Tobit model is that it does not only measure the probability of adoption of technology but also takes care of the intensity of its adoption.

Following Maddala (1992), Amemiya (1985) and Johnston and Dinardo (1997), the Tobit model can be defined as:

\[ Y_{i}^{*} = \beta X_{i} + u_{i} \]

\[ Y = \begin{cases} Y_{i}^{*} & \text{if } Y_{i}^{*} > 0 \\ 0 & \text{if } Y_{i}^{*} \leq 0 \end{cases} \]  

Where,

\( Y_{i} \) = the observed dependent variable, in our case amount of fertilizer applied per hectare.

\( Y_{i}^{*} \) = the latent variable which is not observable.

\( X_{i} \) = Vector of factors affecting adoption and intensity of fertilizer use

\( \beta \) = Vector of unknown parameters

\( u_{i} \) = Residuals that are independently and normally distributed with mean zero and a common variance \( \sigma^{2} \).
An econometric software known as "Limdep" was employed to run the Tobit model. It may not be sensible to interpret the coefficients of a Tobit in the same way as one interprets coefficients in an uncensored linear model (Johnston and Dinardo 1997). Hence, one has to compute the derivatives of the estimated Tobit model to predict the effects of changes in the exogenous variables.

As cited in Maddala (1997), Johnston and Dinardo (1997) and Nkonya et al., (1997), McDonald and Moffit proposed the following techniques to decompose the effects of explanatory variables into adoption and intensity effects. Thus, a change in $X_j$ (explanatory variables) has two effects: (1) It affects the conditional mean of $Y_j^*$ in the positive part of the distribution, and (2) it affects the probability that the observation will fall in that part of the distribution. Similar approach is used in this study.

The marginal effect of an explanatory variable on the expected value of the dependent variable is,

$$\frac{\partial E(Y_j)}{\partial X_i} = F(z) \beta_i$$

The change in the probability of adopting a technology as independent variable $X_i$ is,

$$\frac{\partial F(Z)}{\partial X_i} = f(z) \frac{\beta_i}{\sigma}$$

The change in intensity of adoption with respect to a change in an explanatory variable among adopters is,

$$\frac{\partial E(Y_j / Y_j^* > 0)}{\partial X_i} = \beta_i \left[ 1 - Z \frac{f(z)}{F(z)} - \left( \frac{f(z)}{F(z)} \right)^2 \right]$$

Where, $F(z)$ is the cumulative normal distribution of $Z$, $f(z)$ is the value of the derivative of the normal curve at a given point (i.e., unit normal density), $Z$ is the $z$-score for the area under normal curve, $\beta$ is a vector of Tobit maximum likelihood
estimates and $\sigma$ is the standard error of the error term. T-test and $\chi^2$-test were also employed.

2.3. **Hypothesis and Definition of Variables**

In the course of identifying factors influencing a farmer's decision to use fertilizer, the main task is to analyze which factor influence how and by how much. Therefore, in the following section, potential variables that are supposed to influence adoption and intensity of fertilizer use will be explained.

2.3.1. **The Dependent Variable of the Model (FERTRAT3)**

The dependent variable of the Tobit model has a continuous value. As observed in different empirical studies, this variable can be expressed in terms of ratio, actual figure and log form, depending on the purpose of the study. Consequently, in the present study, actual fertilizer applied per hectare (only fertilized area considered) was taken as the dependent variable of the Tobit model.

2.3.2. **The Independent Variables**

Based on Feder et al. (1985), who extensively reviewed factors affecting adoption of agricultural technologies in low-income countries and on the brief literature review in this study, a total of 16 variables were hypothesized to explain fertilizer adoption and intensity of its use by sample households.

**Age of the household head (AGE):** Older farmers may accumulate more wealth than younger ones so as to finance fertilizer purchase. Moreover, this variable can be considered as a proxy for experience in using fertilizer. Farmers who have enough experience use higher rate of fertilizer. Therefore, this variable was hypothesized to positively influence fertilizer adoption and the intensity of its use.

**Sex of the household head (SEXDM):** This is a dummy variable, which takes a value of 1 if the household head is male, and 0 otherwise. It is expected that male-headed households have more access to fertilizer use.
Education of the household head (EDUCDM): This is a dummy variable, which takes a value of 1 if the household head is literate (can read and write), and 0 otherwise. Education was hypothesized to positively influence adoption decision and intensity of fertilizer use.

Off-farm income (OFFARMDM): This is a dummy variable, which takes a value of 1 if any member of the household is involved in off-farm work for payment, and 0 otherwise. Off-farm income is a very important source of cash for farm households, especially to purchase fertilizer (Reardon et al., 1999). However, in certain cases, the effect is ambiguous. It was expected that off-farm income would have either positive or negative impact on adoption and intensity of fertilizer use.

Family labour Supply (ACTLAB): Labour availability is a variable, which affects farmers' decisions regarding adoption of new agricultural practices or inputs (Feder et al., 1985). It was expected that this variable would have a positive impact on adoption and intensity of fertilizer use.

Hired labour (HIRDLABDM): This is a dummy variable, which takes a value of 1 if the household used hired labour, and 0 otherwise. Therefore, this variable would positively influence adoption and intensity of fertilizer use.

Health status of the household head (ILLNDM): This is a dummy variable, which takes a value 1 if the household head was seriously ill (unable to perform main farm activities) during the main season, and 0 otherwise. This variable was expected to negatively influence adoption and intensity of fertilizer use.

Access to Extension Service (EXTDM): This is a dummy variable, which takes a value 1, if the household received extension service, and 0 otherwise. It was hypothesized that this variable positively influences adoption and intensity of fertilizer use.

Area under improved seed variety (AREAIMP): This variable refers to the total area under improved seed variety. Adoption of improved seed and fertilizer together provides synergistic benefits as improved seed has larger responses to fertilization (Nkonya et al., 1997). Therefore, it was hypothesized that this variable would have positive influence on adoption and intensity of fertilizer use.
Number of livestock owned (TLU): This variable, defined in terms of Tropical Livestock Unit (TLU), may serve as a proxy for the capacity to bear risks of using new technology, such as fertilizer, and capture wealth effect. Livestock may also serve as a proxy for oxen ownership, which is important for farm operations. It was expected that this variable would have positive influence on adoption and intensity of fertilizer use.

Manure application (MANURDM): This is a dummy variable, which takes a value of 1 if the household used manure, and 0 otherwise. In this study, manure refers to animal dung which households apply on their field to improve soil fertility. Regarding this variable, different studies have reported different results. Therefore, it was expected that this variable would have either positive or negative impact.

Proportion of steep slope lands (RASLOP): This variable refers to the proportion of steep slope land to total cultivated land. Fertilizer application on a steep slope area could be a risky venture due to erosion hazard.

Access to input credit (CREDITDM): This is a dummy variable, which takes a value of 1 if the farm household has access to input credit, and 0 otherwise. In this study, it was hypothesized that access to input credit would have positive influence on adoption and intensity of fertilizer use.

Regional differentials: In a number of studies, a more appropriate procedure, which used observations from different climatic or topographical areas, includes location specific dummy variables (Feder et al., 1985). These dummy variables could capture other area specific factors affecting fertilizer use, such as rainfall, soil quality, access to market, etc. Taking the sites in the Tigray region as a reference dummy variable, the following regional dummies were considered in the model.

SITORODM: is a dummy variable with value of 1 for households from the sites of Oromia region, and 0 otherwise.

SITAMADM: is a dummy variable with value of 1 for households from the sites of Amhara region, and 0 otherwise.
SITSADM: is a dummy variable with value of 1 for households from the sites of SNNPRS, and 0 otherwise. Therefore, adoption and intensity of fertilizer use was expected to vary with the regions.

3. RESULTS AND DISCUSSION

3.1. Determinants of Adoption and Intensity of Fertilizer Use

Estimates of the parameters of the variables expected to determine the adoption and intensity of fertilizer use are displayed in Table 1. A total of 16 explanatory variables (including 3 regional dummy) were considered in the econometric model, out of which fourteen variables were found to significantly influence the adoption probability and intensity of fertilizer use among farm households.

The results have shown that gender differentials among the farm households (SEXDM) was positively influencing adoption and intensity of fertilizer use (significant at 10% level). The positive sign indicates that male-headed households were more likely to adopt chemical fertilizers. Being a male-headed household increases the probability of adoption by 5.9%. This result is in conformity with the prior hypothesis. A possible explanation is that there may be gender discrimination.

As expected, education (EDUCDM) was positively influencing the probability of adoption and intensity of fertilizer use (significant at 10% level). Education (the change in status of household head from illiterate to literate) increases the probability of fertilizer adoption by 4.4%. This suggests that ability to read and write would improve access to information so that farmers can easily understand the benefit of fertilizer use.

Supply of active family labour (ACTLAB) was also positively related with adoption and intensity of fertilizer use (significant at 10% level). Each additional unit of active family labour increases the probability of fertilizer adoption by 1.23%. This suggests that adoption of chemical fertilizers is more attractive to households with large number of active labour force.
Access to hired labour (HIRDLBDM) is another important factor, which was positively related to the dependent variable (significant at 1% level). Access to hired labour increases the probability of adoption by 7.22%. Due to the fact that labour is required to apply fertilizer and handle fertilizer-induced mushrooming of weeds, adopters are forced to hire additional labour to supplement family labour.

Of interest is the finding that off-farm income (OFFARMDM) has negative relationship with adoption and intensity of fertilizer use (significant at 5% level). Involvement in off-farm activities reduces the probability of fertilizer adoption by 6.75%. The fact that off-farm income represents the opportunity cost of labour time and cash in agriculture, it looks relatively attractive for households to participate in off-farm activities compared to labour and capital formation in the farmland. This indicates that households who are involved in off-farm activities give less attention to their farm affairs.

Access to extension service (EXTDM) also positively influenced adoption of chemical fertilizer and its intensity (significant at 1% level). Access to extension services increases the probability of adoption by 17.33%. Extension service, as a source of information regarding the benefit of fertilizer use, its application rate, etc., has a strong influence on a farmer's adoption decision and intensification.

Fertilizer adoption and intensity were significantly influenced by the area of land under improved seed (at 1% level). Each additional hectare of land planted with improved seed increases the probability of fertilizer adoption by 8.3%. The implication is that adoption of both technologies combined (i.e. seed and fertilizer) gives better yield and improves profitability as improved seeds have higher responses to fertilizers.

Total livestock owned (TLU) is another factor, which was positively related to the dependent variable (significant at 10% level). Each additional unit of livestock increases the probability of fertilizer adoption by 0.57%. The implication is that livestock is an important source of cash income, which can be used for the purchase of fertilizer in rural areas. In addition, farmers who owned a large number of livestock have the capacity of bearing the risk of using chemical fertilizers. This variable, as a proxy to oxen ownership, suggests that farmers who have larger number of livestock are able to plough their field on time and are encouraged to use more fertilizer.
As would be expected, illness of the household head (ILLNDM) negatively influenced fertilizer adoption and intensity of its use. The coefficient of ILLNDM was negative and significantly related to the dependent variable (at 5% level). Illness of the household head decreases the probability of fertilizer adoption by 6.6%. This implies that households who have a sick family head are not encouraged to adopt fertilizer. This could be due to shortage of labour force and lack of coordination to manage their farm.

Access to input credit (CREDITDM) positively influenced fertilizer adoption and intensity of its use (significant at 1% level). Access to credit increases the probability of fertilizer adoption by 29.2%. This suggests that credit plays a very important role in determining access to fertilizers. Availability of credit minimizes liquidity constraints and thereby enhances adoption of fertilizer and rate of its application.

The rate of adoption and intensity of use of fertilizers tend to decline with increase in the proportion of steep slope of cultivated areas (significant at 5% level). The result has shown that a one per cent increase in the proportion of steep slope land decreases the rate of adoption by 8.21%. This implies that farmers are not encouraged to apply fertilizer on steep slope lands due to erosion hazard and associated risk of crop loss.

It is also apparent from the results that the rate of adoption and intensity of fertilizer application is influenced by regional factors. Taking sites in Tigray region as reference dummy variable, the probability of adoption is higher in the sites of Oromia, Amhara and SNNPRS (Table1). The implication of these results is that situations for fertilizer adoption and intensity of its application are more favourable in Oromia, Amhara and SNNPRS. Such an outcome is not unexpected, given the variations in natural climates, strength of extension service, fertilizer price and fertilizer delivery system across the sites. A study by the National Fertilizer Industry Agency (2001) is also in conformity with the above results.
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Table 1: Maximum Likelihood Estimates of Tobit Model

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Estimated Coefficients</th>
<th>Standard Error</th>
<th>t-ratio</th>
<th>Change in Probability</th>
<th>$\frac{\partial F(z)}{\partial \beta_i}$ $\frac{F(z)}{\sigma}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-77.2154</td>
<td>19.0160</td>
<td>-4.061</td>
<td>-0.0002</td>
<td>0.0590</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.0483</td>
<td>0.2181</td>
<td>-0.221</td>
<td>-0.0002</td>
<td>0.0440</td>
</tr>
<tr>
<td>SEXDM</td>
<td>16.2959</td>
<td>8.3745</td>
<td>1.946*</td>
<td>0.0590</td>
<td>0.0123</td>
</tr>
<tr>
<td>EDUCDM</td>
<td>12.1418</td>
<td>6.7645</td>
<td>1.795*</td>
<td>0.0440</td>
<td>0.0123</td>
</tr>
<tr>
<td>OFFARMDM</td>
<td>-18.6457</td>
<td>8.4056</td>
<td>-2.218**</td>
<td>-0.0675</td>
<td>0.0722</td>
</tr>
<tr>
<td>ACTLAB</td>
<td>3.4067</td>
<td>1.9768</td>
<td>1.723*</td>
<td>0.0335</td>
<td>0.0123</td>
</tr>
<tr>
<td>HIRDLBDM</td>
<td>19.9233</td>
<td>7.2510</td>
<td>2.748***</td>
<td>0.0722</td>
<td>0.1733</td>
</tr>
<tr>
<td>EXTDM</td>
<td>47.8376</td>
<td>9.0256</td>
<td>5.300***</td>
<td>0.1733</td>
<td>0.0830</td>
</tr>
<tr>
<td>AREAIMP</td>
<td>22.9159</td>
<td>8.2120</td>
<td>2.791***</td>
<td>0.1733</td>
<td>0.0830</td>
</tr>
<tr>
<td>TLU</td>
<td>1.5866</td>
<td>0.9595</td>
<td>1.654*</td>
<td>0.0057</td>
<td>0.0057</td>
</tr>
<tr>
<td>MANUREDM</td>
<td>9.2430</td>
<td>6.6098</td>
<td>1.398</td>
<td>0.0335</td>
<td>0.0057</td>
</tr>
<tr>
<td>ILLNDM</td>
<td>-18.1802</td>
<td>8.1361</td>
<td>-2.225**</td>
<td>-0.0659</td>
<td>0.2920</td>
</tr>
<tr>
<td>CREDITDM</td>
<td>80.6337</td>
<td>7.2570</td>
<td>11.111***</td>
<td>0.2920</td>
<td>0.2920</td>
</tr>
<tr>
<td>RASLOP</td>
<td>-22.6701</td>
<td>9.2860</td>
<td>-2.441**</td>
<td>-0.0821</td>
<td>0.2353</td>
</tr>
<tr>
<td>SITORODM</td>
<td>64.9662</td>
<td>13.7077</td>
<td>4.739***</td>
<td>0.2353</td>
<td>0.2024</td>
</tr>
<tr>
<td>SITAMADM</td>
<td>55.8840</td>
<td>13.7848</td>
<td>4.054***</td>
<td>0.2353</td>
<td>0.2024</td>
</tr>
<tr>
<td>SITSADM</td>
<td>109.3436</td>
<td>15.2443</td>
<td>7.173***</td>
<td>0.3961</td>
<td>0.3961</td>
</tr>
</tbody>
</table>

***, **, * These symbols denote level of significance at 1%, 5% and 10%, respectively.

3.2. Effects of Changes in the Significant Explanatory Variables on the Intensity of Fertilizer Use

The results of the Tobit model can be used to identify the effects of changes in the explanatory variables on the intensity of fertilizer use. Table 2 presents the effect of marginal changes (derivatives) in explanatory variables on the intensity of fertilizer application among adopters and among the entire sample households.

Except for off-farm activity (OFFARMDM), proportion of steep slope land (RASLOP) and Illness of the household head (ILLNDM), a marginal change in other significant variables has a positive influence on the intensity of fertilizer use. On the average, change in the education status of the household head (from illiterate to literate) increases fertilizer application per hectare by 6.23 kg among adopters. Similarly,
among adopters, sex status of the household head (being a male) increases fertilizer application per hectare by 8.36 kg. A unit increase in the supply of active family labour increases fertilizer application per hectare by 1.75 kg. Likewise, access to hired labour increases fertilizer application per hectare by 10.22 kg. On the contrary, due to the reasons explained under section 3.2.1, illness of the household head and involvement of any member of the household in off-farm activities reduce fertilizer application rate by 9.33 kg and 9.57 kg among adopters respectively, *ceteris paribus* (Table 2).

Variables representing institutional service have strongly influenced intensity of fertilizer use. Access to extension service and input credit increase fertilizer application per hectare by 24.54 kg and 41.37 kg respectively among adopters, *ceteris paribus*.

With regard to variables representing landholding and its characteristics, proportion of steep slope cultivated land negatively influenced intensity of fertilizer use, while area planted with improved seed had positive influence. A one per cent increase in the proportion of steep slope land decreases fertilizer application per hectare by 11.63 kg. Each additional hectare of area covered by improved seed increases fertilizer application rate by 11.76 kg among adopters, *ceteris paribus*.

The wealth variable used in the analysis, i.e., number of total livestock (TLU) owned, has a positive effect. A unit increase in the number of livestock owned increases fertilizer application rate by about 0.81 kg among adopters.

Site dummy variables were used in the analysis to capture specific regional factors, such as rainfall, soil quality and access to input and output market, etc. Taking the sites in the Tigray region as a reference group, the analysis has shown that situations for increasing fertilizer use intensity were relatively better in the sites of Oromia, Amhara and SNNPRS. For instance, an increase of 56.10 kg, 33.33 kg, and 28.67 of fertilizer application was registered in the sites of SNNPRS, Oromia and Amhara, respectively among adopters, *ceteris paribus*.
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Table 2. The Effects of Change in the Significant Explanatory Variables on Intensity of Fertilizer Application

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Change Among Adopters</th>
<th>Change Among the Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \frac{\partial E(Y_i/Y'_i)}{\partial X_i} &gt; 0 )</td>
<td>( \frac{\partial E(Y_i)}{\partial x_i} )</td>
</tr>
<tr>
<td>SEXDM</td>
<td>8.3603</td>
<td>11.8195</td>
</tr>
<tr>
<td>EDCDM</td>
<td>6.2292</td>
<td>8.8065</td>
</tr>
<tr>
<td>OFFARMDM</td>
<td>-9.5659</td>
<td>-13.5238</td>
</tr>
<tr>
<td>ACTLAB</td>
<td>1.7479</td>
<td>2.4709</td>
</tr>
<tr>
<td>HIRDLBDM</td>
<td>10.2211</td>
<td>14.4505</td>
</tr>
<tr>
<td>EXTDM</td>
<td>24.5423</td>
<td>34.6968</td>
</tr>
<tr>
<td>AREAIMP</td>
<td>11.7566</td>
<td>16.6210</td>
</tr>
<tr>
<td>TLU</td>
<td>0.8144</td>
<td>1.1508</td>
</tr>
<tr>
<td>ILLNDM</td>
<td>-9.3269</td>
<td>-13.1862</td>
</tr>
<tr>
<td>CREDITDM</td>
<td>41.3676</td>
<td>58.4839</td>
</tr>
<tr>
<td>RASLOP</td>
<td>-11.6304</td>
<td>-16.4427</td>
</tr>
<tr>
<td>SITORODM</td>
<td>33.3294</td>
<td>47.1202</td>
</tr>
<tr>
<td>SITAMADM</td>
<td>28.6701</td>
<td>40.5328</td>
</tr>
<tr>
<td>SITSADM</td>
<td>56.0967</td>
<td>79.3074</td>
</tr>
</tbody>
</table>

Log Likelihood function = -4598
Sigma (\( \sigma \)) = 91.989 \( f(z) = 0.3332 \)
\( z = 0.60, F(z) = 0.7253 \)

4. CONCLUSIONS AND POLICY IMPLICATIONS

4.1. Conclusions

Analysis of the extent of fertilizer adoption by sample households has shown that 60% of the households were adopters. Farmers in the study sites applied only about 59% of the recommended rate of fertilizers. Of the total land cultivated by the sample households about 44% received chemical fertilizers.

Econometric software called "Limdep" was employed to estimate the Tobit model to identify factors influencing the adoption of fertilizer and intensity of its use.
Probability of fertilizer adoption and intensity of its use appears to be significantly and positively influenced by education, extension service, area under improved seed, total livestock owned, access to input credit, number of active family labour, access to hired labour and gender difference (being a male), while the influence of illness of the household head, off-farm employment and ratio of steep slope land to total cultivated land was negative and significant.

Regional differentials also influence the probability of adoption and intensity of fertilizer use showing that households are operating under different natural conditions, different input supply system, and unbalanced accessibility to infrastructure that would facilitate the adoption of fertilizers.

4.2. Policy Implications

On the basis of the results of this study, the following policy implications are suggested for future intervention strategies to promote production-increasing technologies, such as chemical fertilizers. These may be broadly viewed as strengthening agricultural extension service, developing human capital and facilitating farmers' access to financial capital.

**Development of Human Capital:** The study has shown that labour supply (that of family and hired), education, sex and health status of the household head are among the significant variables affecting the probability of adoption and intensity of fertilizer use. This underscores the importance of human capital development through improving farmers' access to education and health service facilities.

**Strengthening Agricultural Extension Services:** The result of the econometric model showed that access to extension service is a very important variable that positively influenced the adoption and intensity of fertilizer use. In addition, descriptive analysis revealed that farmers are using sub-optimal level of chemical fertilizers. Therefore, to sustain the positive contribution of the extension service to the adoption and intensity of fertilizer use, the strengthening of agricultural technology outreach services is necessary. Furthermore, strengthening research support to the extension service, through developing appropriate fertilizer application rates, taking into consideration the specific characteristics of soils in different localities, is the other issue that requires due attention.
Improve Farmer's Access to Financial Capital: The analysis of determinants of adoption and intensity of fertilizer use revealed that wealth of the farm households (mainly total livestock owned) and access to input credit have significant positive effects. Therefore, efforts aimed at promoting productivity enhancing inputs, such as fertilizers, should also take into account the importance of the livestock sub-sector. In addition, establishment of rural finance is very important to sufficiently extend input credit to resource poor farmers.
References


PART IV

RURAL INSTITUTIONS AND COMMERCIALISATION OF SMALLHOLDER AGRICULTURE IN ETHIOPIA
RURAL LIVELIHOODS AND EXTENSION PROGRAMME PARTICIPATION: EVIDENCE FROM AWASSA ZURIA DISTRICT, SNNPR, ETHIOPIA.

Tewodros Tefera* and Moti Jaleta+

Abstract

This paper examines rural livelihood differences of extension programme participant and dropout farmers by identifying factors that contribute to continuing participation and its impact on household food self-sufficiency. A survey data were collected for the study in 2003 from a randomly selected 65 participant and 27 dropout farm households living in Maqibassa and Dure-Bafano peasant associations in Awassa Zuria district, SNNPR, Ethiopia. Empirical estimation models, like limited dependent variable and switching regression analyses methods, were employed to analyse the data.

Estimation results show that the probability of households' participation in the current extension programme increases significantly with increasing household wealth status and length of participation in the extension programme but decreases with increasing family size, age and education level of the household head. Household food self-sufficiency decreases significantly with increasing family size and age of household head for both groups. Plot size significantly increases food self-sufficiency status of farm households whether they are participants in or dropouts from the programme. The more the household is educated the less the household is food secured. Though long time participation of households in extension programme does not show significant improvement in household food self-sufficiency, it has strong negative effect on dropout households' food self-sufficiency. Marginalizing the poor rural households from the current extension programme aggravates rural livelihood insecurity and rural poverty for which it was meant as a remedy. This capitalizes on the need to consider a paradigm shift from production-oriented agricultural extension to livelihood extension approach which comprises of agricultural and non-agricultural rural interventions which help the poor rural farm households secure their livelihood by making use of available resources.

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+ Debub University, Awassa College of Agriculture, Department of Agricultural Resource Economics and Management.
1. INTRODUCTION

Despite the many efforts that have been made to mitigate food insecurity in Ethiopia, the majority have become food aid recipients year after year. The magnitude of the problem is escalating and has attracted the attention of the government and the international community. Even during good agricultural years, between 4 and 6 million people are in need of food aid (FAO 2001). This perpetuates dependency on massive inflow of food aid at the expense of long-term domestic agricultural development. The proportion of the population, which is unable to attain its minimum nutritional requirements, is estimated to stand at 52% of the rural population and 36% of the urban population (MEDaC 1999). The World Development Report indicators for the year 2000/01 reveal occurrence of 48% malnutrition amongst children under age 5 during the period 1992/98.

Attempts to improve food production through increased use of chemical fertilizers and improved seeds do not show notable improvement in national food production (Berhanu 2004). Many studies and official reports explained the low productivity of Ethiopian agriculture vis-à-vis dependency on nature and natural endowments. However, the poor performance of the sector could not be explained by natural endowments alone but also by inappropriate policies, lack of physical infrastructure, institutional structure and processes that neglect the strategic role of smallholder agriculture.

Since 1993, Agricultural Development-Led Industrialisation (ADLI) has been the hallmark of development strategy in Ethiopia. The strategy aims at attaining food self-sufficiency in the short-term and bringing structural transformation of the economy in the long-term as its priority agenda. To this end, the new extension programme, Participatory Demonstration and Training Extension System (PADETES) is being used as a policy instrument to bridge the gap between low agricultural productivity and the potential productive capacity of the sector. However, technological transformation through the use of external inputs, such as inorganic fertilizer, improved seeds, agrochemicals etc., depends, at least, on a significant number of
farmers' participation and adoption of these technologies and favourable socio-economic environment that responds to the change in the supply of outputs (Abebe and Mulat 2004).

A number of concerns could be raised as problems in the proposed Green Revolution path of technological transformation of Ethiopian agriculture. For instance, the poor complementary nature of services, such as extension, credit, marketing, infrastructure and inadequate institutional capacity to assemble the necessary mix, is one aspect of the problem (Arega et al., 2003). In addition, there are different endowment profiles prevailing in the farming communities with the capability of changing the existing opportunities into tangible livelihood strategies and outcomes (Abebe 2003). The above signifies the importance of having a closer look into the extension programme and its impact on the well being of programme participants and non-participating households and the elicitation of determinant factors which contribute to participation or otherwise. The other concerns include the low level of technological development and inadequate capacity to finance the process of technology dissemination amongst the poor smallholder farmers.

Furthermore, analytical findings show that maintaining the momentum of Green Revolution type of agricultural development requires market-oriented interventions in order to absorb surplus production, thus motivating farmers to produce more. This beckons agricultural commercialisation where the majority of the produces are supplied to the market (Govereh et al., 1999). Markets, therefore, should function well and allow households to increase their income by directing them towards production activities that ensure higher returns to land and labour resources. Moreover, markets should ensure rural households that they could buy consumption items rather than being limited to produce only the goods they need to consume (Timmer 1997).

In the technological transformation and commercialization process, quick uptake of technology by the intended target category is a necessary condition. Many researches have been conducted to know to what extent rural farm households use the externally induced technologies. However, most of them focused their analysis on the reason and determinants of adoption from technical, economic, and social perspectives. These findings are limited to the dichotomous division of adopters and non-adopters. This makes adoption studies partial and unable to feedback why some farmers withdraw from continuous application of technologies. Filling the information
gap by practical evidences on the impact of extension programme on participant and dropout households, and identifying some of the hurdles the later faced in their struggle to achieve secured livelihood is judicious.

The main purpose of this study is, therefore, to examine the implication of rural livelihood for extension programme and agricultural development strategies. By so doing, the study generates relevant grassroots information that contributes towards better understanding of rural livelihood that has policy implications. To this effect, the following two specific objectives are addressed in the study.

1. To examine the features contributing towards continuing as a participant in the agricultural extension programme.
2. To shed light on the relationship of household food self-sufficiency and livelihood security status as impact of agricultural extension participation.

Section 1 being the introduction to this study paper, the remaining part is sub-divided into four sections. In Section 2, the study area and survey data are described. Section 3 explains the methodology adopted for this study. Estimation results are discussed in Section 4. Finally, Section 5 summarises the study by drawing general and specific conclusions.

## 2. STUDY AREA AND DATA DESCRIPTION

### 2.1. Study Area

The Awassa Zuria district is located in Sidama Zone of the Southern Nations Nationalities and Peoples Region (SNNPR). The district shares boundary with Oromiya Region to the Northeast, Wolayta zone to the West, and Shabadino and Borecha districts to the South. Awassa Zuria is one of the nine districts in Sidama zone and occupies a total area of 920,000 hectares. Out of this total area, nearly half is currently cultivated and covered with both annual and perennial crops. About 16.2 per cent is allocated to grazing, while 2.7 per cent is covered with bushes and forests. The remaining 34.1 per cent represents settlements, infrastructure, water body and unproductive land. The district can be categorised into three agro ecological zones: 75 per cent of the total land stands at middle altitude, and the high and low altitudes
are 20 per cent and 5 per cent, respectively. The mean annual rainfall of the district ranges between 800-1200 mm. However, figures from Awassa metrology station and farmers' report during group discussion confirmed that the timing and duration of rain is unpredictable and unreliable and as a result recurrent drought has become a common feature of the district.

2.2. Sampling and Data Collection

This study is based on a sample survey of 65 programme participants and 27 dropout farmers living in Maqibassa and Dure-Bafano peasant associations (PAs) in Awassa Zuria district in 2003. The two PAs were selected because of their importance in the extension package programme in the area. To arrive at the selection of respondent households stratified sampling techniques were employed. First, the sample frames were developed in terms of participation and dropout status for each PA, and, finally, a total of 92 households were randomly selected for the study.

To complement the survey result, group discussions and wealth ranking techniques were used with focus group and key informants respectively.

2.3. Data Description

In this study both qualitative and quantitative data sets are used. Different social and economic variables, expected to explain farm household participation status in the extension programme and household livelihood security, were used. Table 1 gives the general description of variables used in the analysis.

Wealth status of the households is ranked by the community members themselves, using some key informants. They considered all aspects of resource endowments, such as landholding size, number of livestock, magnitude of workforce in the household and so on to group the households into three different wealth status categories. Relatively well-to-do households were assigned 1, 3 for the poor and 2 for the average ones. Education level is computed by assigning 1 for household heads who left school at primary level, 2 at junior secondary, and 3 at high school. Plot size is measured in hectares.
**Table 1. Description of Variables Used in the Study**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dropouts</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Family size</td>
<td>8.89</td>
<td>2.94</td>
<td>5</td>
<td>16</td>
<td>7.89</td>
<td>2.78</td>
<td>1</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of Household head</td>
<td>46.22</td>
<td>13.95</td>
<td>24</td>
<td>70</td>
<td>42.42</td>
<td>13.13</td>
<td>20</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education level of household head</td>
<td>1.93</td>
<td>0.96</td>
<td>1</td>
<td>4</td>
<td>1.94</td>
<td>1.06</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of plots owned</td>
<td>1.22</td>
<td>0.51</td>
<td>1</td>
<td>3</td>
<td>1.42</td>
<td>0.68</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plot size</td>
<td>0.74</td>
<td>0.30</td>
<td>0.25</td>
<td>1.5</td>
<td>0.81</td>
<td>0.30</td>
<td>0.25</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of farm implements</td>
<td>3.26</td>
<td>2.14</td>
<td>0</td>
<td>10</td>
<td>3.91</td>
<td>2.79</td>
<td>0</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen</td>
<td>1.30</td>
<td>2.02</td>
<td>0</td>
<td>10</td>
<td>1.58</td>
<td>1.14</td>
<td>0</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plough owned</td>
<td>0.89</td>
<td>0.51</td>
<td>0</td>
<td>2</td>
<td>1.06</td>
<td>0.53</td>
<td>0</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maize marketed surplus (ql)</td>
<td>3.96</td>
<td>3.74</td>
<td>0</td>
<td>11</td>
<td>6.0</td>
<td>6.45</td>
<td>0</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of participation in CEP</td>
<td>2.33</td>
<td>1.11</td>
<td>2</td>
<td>7</td>
<td>4.14</td>
<td>1.75</td>
<td>1</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Self-Sufficiency Index</td>
<td>0.65</td>
<td>0.28</td>
<td>0.15</td>
<td>1.28</td>
<td>1.04</td>
<td>0.98</td>
<td>0.21</td>
<td>7.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discreet Variables**

<table>
<thead>
<tr>
<th>Wealth status</th>
<th>Dropout Per centage (No=27)</th>
<th>Participants (No=65) Per centage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better off</td>
<td>18.5</td>
<td>35.4</td>
</tr>
<tr>
<td>Medium</td>
<td>33.3</td>
<td>56.9</td>
</tr>
<tr>
<td>Poor</td>
<td>48.2</td>
<td>7.7</td>
</tr>
<tr>
<td>Radio ownership</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14.2</td>
<td>20</td>
</tr>
<tr>
<td>No</td>
<td>85.2</td>
<td>78.5</td>
</tr>
<tr>
<td>Monthly contact with DA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>15.4</td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>86.6</td>
</tr>
</tbody>
</table>

**Source:** Survey data 2003.
Food self-sufficiency index (FSSI) is calculated using an index formulated by Kuma et al. 1989 (cited in Neshan (1998). The index is computed as,

\[ FSSI = \frac{\text{two years maize yield average per HH} - 15\% \text{ post harvest loss}}{\text{Adult Equivalent per household} \times \text{Recommended cereals per AE}} \]

The index calculates the ratio of maize grain produced and made available to household consumption to the total family food requirement per year. 15% of the total harvest is assumed to be lost due to lack of appropriate storage facilities. The average recommended cereal consumption is taken to be 1.9 quintals per adult per year (Kuma et al., 1989, as cited in Lishan 1998).

3. ESTIMATION METHODS

In this section the methodologies adopted to estimate farm household participation status in the current extension programme and its impact on household livelihood security status are explained.

3.1. Participation Status

After adopting the current agricultural extension programme of rural Ethiopia, a farm household may continue as a participant of the programme or become a dropout for different reasons. The binomial Logit model helps to estimate the probability that a given farm household, with its own specific features, continues as a participant in the programme. Needless to mention is that one minus the estimated probability of continuing as a participant in the programme gives the probability to be a dropout from the programme. The binomial Logit model used for this estimation is specified as,

\[ Pr(PPS_i) = \frac{e^{\beta X_i}}{1 + e^{\beta X_i}} \] (1)
Where $PPS_i$ stands for household participation status in the extension programme (i.e., it takes a value of 1 for participants and 0 for dropouts), $\beta$ is a vector of parameters to be estimated and $X_i$ is a vector of household specific features, like family size, age and education level of household head, household wealth status, and length of participation in extension programme.

The marginal effects of each explanatory variable on the probability of farm household participation status are computed based on their average values as,

$$\frac{\partial \Pr(PPS_i)}{\partial X_j} = \beta_j \cdot \Pr(PPS_i) \cdot [1 - \Pr(PPS_i)]$$

(2)

Where $\beta_j$ is the parameter attached to the $j^{th}$ explanatory variable ($X_j$).

### 3.2. Livelihood Security

The level of livelihood security at farm household level is estimated through its proxy indicator, which is food self-sufficiency index ($FSSI$). In computing food self-sufficiency index, annual maize production per household is considered, as maize is the major food crop produced and consumed by households in the study area. Furthermore, analysis on livelihood security could be done by considering gross household income, marketed outputs, yield stability, both in good and bad years, and so on. For the purpose of this study, however, we considered self-sufficiency in maize production and consumption as a proxy to livelihood security of farm households as the current agricultural extension programme solely emphasizes a package programme that potentially enhances maize yield per farm plots in the study area.

Thus, the effect of household participation in the current extension programme on food self-sufficiency (as a proxy to livelihood security) is estimated using switching regression analysis. Years of participation in the extension programme is included as a proxy explanatory variable to see the effect of programme participation on food self-sufficiency. Since food self-sufficiency is an index computed from positive values, it has a positive real number value for each household. This makes $FSSI$ a continuous variable where a household with value above 1 is more than food sufficient, below 1 is less than sufficient and 1 is just self-sufficient. In the regression analysis,
household participation status can be included as a dummy variable. However, there is a significantly strong correlation between food self-sufficiency index and household participation status. Therefore, taking participation status as a dummy variable and estimating the whole effect in one equation erodes the effect of other variables as they might also explain household participation status.

The regression model that can explain household food self-sufficiency status can be specified as,

\[
FSSI_{ij} = \beta_0 + \beta_1 WLT_i + \beta_2 FMLSZ_i + \beta_3 PLOSZ_i + \beta_4 AGE_i + \beta_5 EDU_i + \beta_6 YPP + u_i
\]

Where \( FSSI_{ij} \) is food self-sufficiency index of the \( i^{th} \) household in the \( j^{th} \) extension programme participation status (participant or dropout), \( WLT \) is wealth status, \( FMLSZ \) and \( PLOSZ \) refer to family and plot size, respectively, \( AGE \) and \( EDU \) are age and education level of the household head, and \( YPP \) is household's years of participation in the extension programme. The \( \beta \)'s are parameters to be estimated.

### 4. ESTIMATION RESULTS

The above explained Logit and switching regression models are estimated using STATA E 8.0 software and the estimation results are presented in the next two subsections for participation status and livelihood security separately.

#### 4.1. Participation Status

The probability of households' participation status in the current extension programme increases significantly with increasing years of participation in the extension programme and decreases with increasing family size, age and education level of the household head, and household wealth status (see Table 2).

Among all explanatory variables used in explaining the probability of farm household participation status in the current extension programme, the relative wealth status of
households has a higher marginal effect. Duration of participation in the programme also has higher marginal effect next to wealth status. Here, it is most likely that wealthier farm households adopted the programme earlier than the relatively poor ones since participation into the programme has its own costs. Even after participation started, the wealthiest households can have the capacity to sustain any external shocks, like weather or price shocks, which can possibly diminish their likelihood of participation. Relatively educated household heads are less probable to continue as participants in the programme. This might be due to the fact that most educated ones are young with low wealth status and who are vulnerable to weather and price shocks and hence look for other options than continuing as participants in the programme. On the other extreme, the probability to continue as a participant decreases with increasing age of the household head and family size. Normally, there is a strong correlation between age of household head and family size, but both significantly reduce the probability to continue as a participant.

<table>
<thead>
<tr>
<th>Dependent Variable (Participation Status)</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>P-value</th>
<th>Marginal effect</th>
<th>Mean value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family size</td>
<td>-0.209</td>
<td>0.126</td>
<td>0.099</td>
<td>-0.028</td>
<td>8.2</td>
</tr>
<tr>
<td>Household head's age</td>
<td>-0.039</td>
<td>0.028</td>
<td>0.162</td>
<td>-0.005</td>
<td>43.5</td>
</tr>
<tr>
<td>Wealth status*</td>
<td>-1.668</td>
<td>0.521</td>
<td>0.001</td>
<td>-0.226</td>
<td>1.9</td>
</tr>
<tr>
<td>Household head education</td>
<td>-0.587</td>
<td>0.354</td>
<td>0.097</td>
<td>-0.080</td>
<td>1.9</td>
</tr>
<tr>
<td>Years of participation</td>
<td>0.846</td>
<td>0.261</td>
<td>0.001</td>
<td>0.115</td>
<td>3.6</td>
</tr>
<tr>
<td>Constant</td>
<td>6.311</td>
<td>2.682</td>
<td>0.019</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Survey data 2003.

Note: * Wealth status is ranked from 1 to 3, where 1 indicates relatively the best wealthy household.

4.2. Livelihood Security

Estimation results from a switching regression are illustrated in Table 4.2 below. The results show that household food self-sufficiency status is explained by different
variables for the different households grouped along their participation status. Food self-sufficiency decreases significantly with increasing family size and household head’s age. Plot size itself significantly increases food self-sufficiency status of farm households, irrespective of their participation status. The more the household is educated, the less the household is food secured. This might be due to the fact that young and educated household heads have less access to land. Long-time participation of households doesn’t show significant improvement in household food self-sufficiency. This might be due to the high risk of weather vagaries and the inappropriate credit repayment schedule that force households to sell large quantity of grain at low price immediately after harvest.

Table 3. Estimation Results of Household Food Self-sufficiency

<table>
<thead>
<tr>
<th>Dependent Variable (FSSI)</th>
<th>Dropouts</th>
<th></th>
<th>Participants</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>P-value</td>
<td>Coef.</td>
<td>Std. Err</td>
</tr>
<tr>
<td>Wealth</td>
<td>-0.046</td>
<td>0.053</td>
<td>0.403</td>
<td>-0.011</td>
<td>0.182</td>
</tr>
<tr>
<td>Family size</td>
<td>-0.076</td>
<td>0.017</td>
<td>0.000</td>
<td>-0.189</td>
<td>0.048</td>
</tr>
<tr>
<td>Age of household head</td>
<td>-0.011</td>
<td>0.003</td>
<td>0.005</td>
<td>-0.003</td>
<td>0.010</td>
</tr>
<tr>
<td>Household head’s education</td>
<td>-0.154</td>
<td>0.044</td>
<td>0.002</td>
<td>0.151</td>
<td>0.119</td>
</tr>
<tr>
<td>Plot size</td>
<td>0.806</td>
<td>0.148</td>
<td>0.000</td>
<td>0.918</td>
<td>0.394</td>
</tr>
<tr>
<td>Years of participation</td>
<td>-0.076</td>
<td>0.030</td>
<td>0.021</td>
<td>-0.001</td>
<td>0.062</td>
</tr>
<tr>
<td>Constant</td>
<td>1.792</td>
<td>0.348</td>
<td>0.000</td>
<td>1.638</td>
<td>0.781</td>
</tr>
</tbody>
</table>

Source: Survey data 2003.

For the dropout farm households, the longer the years one stayed in the programme as a participant, the less one is currently secured in food self-sufficiency. As explained above, the participation period in the extension programme does not guarantee food self-sufficiency by itself as a one-season bad weather can have a devastating effect on the household. Moreover, crop failure will force households to sell their animals and to repay their debts and their capacity to be food self-sufficient becomes eroded.
Thus, the general argument that participation in the extension programme augments food self-sufficiency does not hold water since the first step of adoption of technologies is strongly influenced by prior food security status of households.

5. DISCUSSION AND CONCLUSIONS

This study tried to investigate the livelihood differences of participating and dropout farmers in maize extension programme. In addition, the study had identified factors that influence households to remain in the programme and the following useful conclusions are drawn from the study.

First, it is most likely that farm households with higher wealth status remain as participants over a long period of time even though the programme comprises of costly technology packages. Wealth, measured in whatever unit agreed by the local households, helps to diminish unanticipated external shocks that extremely reduce farm profits and make households unable to pay their loan on technology packages forwarded through extension programmes. The above facts can be seen from two different perspectives. The technology suppliers prefer above average farm households to ensure repayments of the technology costs supplied on credit. Poor households are reluctant to take the technology due to their limited capacity to cope with external shocks. Therefore, resource endowment disparity put farm households in different positions in their decision towards technology adoption and continuation, even if adopted for a given good harvest and higher market prices for the crop under question.

Second, when households are below the food security threshold level they are looking for a 'fail safe' minimum guarantee, less capital intensive and less risky ventures in spite of repeated promises of high yields and maximum profits that are associated with more risk and higher capital intensity. Therefore, those households below the food security threshold should not be pushed hard to participate in the programme before they cross the household food security threshold and gain adequate resource base that enables them to bear the risk associated with programme participation.
Third, generally, marginalizing the poor rural households from the current extension programme aggravates rural livelihood insecurity and rural poverty, contrary to the intended objective of the programme. This capitalizes the need to consider a paradigm shift from production-oriented agricultural extension to livelihood extension approach, which comprises agricultural and non-agricultural rural interventions, with the objective of giving the poor rural farm households the opportunity of securing their livelihood by making use of available resources. Finally, this study stimulates further studies to assess why households fail to continue in the agricultural extension programme.
References


THE ROLE OF INFORMAL FINANCE IN RURAL ECONOMY: THE CASE OF GURAGE AND SIDAMA ZONES

Kejela Gemtessa*, Bezabih Emana**, Dhunfa Lemessa+, Gezhegn Ayele++

Abstract

This paper is part of the study conducted on informal finance in Ethiopia1. The study was carried out in Shebedino Woreda, Sidama Zone and in Sodo Woreda, Gurage Zone. Two rural and one urban Kebele administrations were purposively selected from each woreda. Two types of questionnaires were prepared and administered on informal lenders and borrowers. The samples covered a total of 272 households of which 184 were borrowers and 88 were lenders. This paper, however, analyzes the data collected using the PRA method and describes the roles and characteristics of informal credit and savings and draws on lessons learnt.

Informal finance providers identified in the study area are private money-lenders, group-based informal associations, and relatives/friends. Private lenders lend cash at an interest rate of 5-15 per cent per month. Four types of private lending are practiced. These are cash-for-cash lending, cash-for-commodity lending, commodity-for-commodity lending, and commodity-for-cash lending. One-Market-Day loan is also identified.

Group-based informal financial service providers identified in the study area are Iddir, Iqquib, and Festivals/Meskel Aksiyons. Apart from their usual business, Iddirs started providing loan with an interest rate of 10 per cent in six months. On the other hand, Festival/Meskel Aksyon is an association established for sharing meat during festival/Meskel. Iqquib is another type of informal finance, which provides both saving and credit services to its members.

Ordinary loan (free credit from friends/relatives) is another type of credit provided by relatives and friends. Such credit usually does not bear interest. Rather, reciprocity in similar or in other form is expected.

* WIBD Consult
** Oromia Agricultural Research Institute.
* Freelance Consultant.
** Ethiopian Development Research Institute.
1 The study was commissioned by the Association of Ethiopian Micro-finance Institutions (AEMFI). We are grateful to AEMFI for giving us permission to present this paper in the Conference.
The major lesson is the diversity of informal finance service in the rural area, its huge contribution to rural economy, flexibility, adaptability, and smooth operation supported by the social and traditional ties in the society.

1. INTRODUCTION

National governments and international aid agencies commonly intervene in financial Markets in Africa. These interventions use a substantial amount of resources and may have dramatic macroeconomic consequences (World Bank 1989). Over the past few decades, there has been a rising call for financial market liberalization. The recommendation that credit markets be liberalized is based on simple and compelling economic logic: interest rate ceilings lower the supply and raise the demand for credit, leading to administrative rationing and associated rent-seeking behaviour, while discouraging saving mobilization. This analysis and the consequent recommendations are undoubtedly and substantially correct for the formal sector.

However, a vast majority of financial transactions occur outside the boundaries of the regulated banking sector and are considered as informal financial sectors. It is often difficult, at the outset, to draw the line demarcating the formal from the informal sector (Chandavarkar 1985). Informality and flexibility of operations are the defining characteristics of the informal sector as a feature that gives the informal sector its lower transaction cost advantage. In fact, the informal sector is often better identified by its basic characteristics, such as ease of entry and exit, freedom from official regulation, multiple interest relationship between transactions, small-scale operations and, above all, the informality of transactions (ibid 1985).

In recent years, research in informal financial services and systems has significantly deepened understanding of the way they operate, their strengths and weaknesses. However, most of the literature has drawn its evidence on financial transactions in developing countries from outside of Africa.

Studies in Africa and elsewhere indicated that different forms and functions of informal finance demonstrate the adaptability of these systems to different economic conditions and changing circumstances. Generally, three types of informal units have been identified in Africa (Aryeetey Christopher and Udry 1995). These are:
The Role of Informal Finance in Rural Economy: The Case of Gurage and Sidama

- Savings mobilization units that do little or no lending;
- Lending units that seldom engage in savings mobilization; and
- Units that combine deposit mobilization with some amount of lending, albeit to members of distinct associations or groups mainly.

The definition of informal finance in Africa is diverse and wide. It embraces Savings and Credit Associations (SCA) which are popular in Africa, professional money-lenders, part-time money-lenders, such as estate owners, traders, grain millers, smallholder farmers, employers, relatives and friends, mobile bankers, generally known as susu or esusu collectors in West Africa, credit unions, co-operative societies, etc. the activities of informal finance is widespread in both urban and rural areas.

Informal units observed in Ghana, for example, include money-lenders, SCA or susu groups, savings and credit cooperatives (SCC), susu collectors, mutual assistance groups, landlords, neighbours, friends, family members, etc. (Aryeetey 1994). Money-lenders seldom lend large amount of money on individual basis. Money-lenders have been known to be important commercial lenders, often lending from surplus incomes earned from farming or trading. Other informal units usually take the form of groups or associations that take deposits from members and provide varying forms of financial services to their members and sometimes to others. Their services are intended to meet the consumption need of members over short periods of time. It is also a way of acquiring fixed assets that require relatively high investment. An example might be the case of SCA members using accumulated funds to purchase such household items as refrigerators, an item they could not afford in the short run from own sources. Moreover, informal finance provides loans for the purchase of commercial inputs for production and cash generation.

Rotating savings and credit associations (ROSCAs or Tontines) in Senegal operate among salaried employees (people with fairly regular incomes, such as teachers, doctors and other public employees) as well as market women. As a result, tontines are more common in towns than in villages (USAID 1989). Numerous studies have also shown that similar types of ROSCA institutions are present in Ethiopia serving the society with both credit and saving functions.
A lot remains to be learnt about the enforcement of informal credit contracts in Ethiopia in particular, and Africa in general. The current state of knowledge is very limited. What is the type of informal credit? What is the prevalence of default on informal loans? What are the consequences of a default? Is it true that defaulters are excluded from future access to credit? Are additional social sanctions imposed? How do lenders who have become victims of defaulters prevent that borrower from getting loans from other lenders? What is the scope of informal lending in these circumstances? If any loan transactions do occur across long distances or great social boundaries, how are they enforced? All of these questions are qualitative and can be addressed with minimal quantitative techniques, but they are essential for understanding the operation of informal financial markets.

The objectives of this study were to identify the different types of informal financial sources and describe the role they play in the household economy in the study area.

2. CONCEPTUAL FRAMEWORK

There exists a substantial and well-developed literature on the economic theory of credit markets and saving decisions in economies characterized by incomplete markets and imperfect information in developed economies (Aryeetey and Udry 1995). Nevertheless, the theoretical literature on informal financial markets has drawn most of its inspiration from evidence on financial transactions in developing countries, outside of Africa. The extent to which this theory can provide insight into informal finance in Africa is not yet determined. Although there are various attempts to support the informal financial sector, with empirical evidences lacking, however, most of the literature on informal finance in Africa lack that part of the knowledge which integrate economic theory with empirical observation. Among the few studies, which shed light on the subject, is the one contributed by Aryeetey and Udry 1995.

It is, indeed, our conceptual argument that simple theoretical framework is based on information asymmetries in financial transactions except that we do not lend ourselves to claim that the theoretical work directly reflects the African context of informal finance.
A simple theoretical argument is that a loan transaction involves the exchange of current resources for future resources. It, therefore, involves a promise. If a loan transaction occurs in a risky environment, and if a complete set of markets for contingent commodities does not exist, then the promised transfer of future resources may not be certain. The character of the loan transaction will then be influenced by the risks faced by the parties involved, and by their knowledge of each other and the activities they undertake. One particular form on information asymmetry in this assumption is the possibility that lenders do not have perfect information regarding the behaviour/creditworthiness of potential borrowers.

There is a great deal of heterogeneity among farmers/borrowers in any village. While lenders might have a good idea about the average behaviour of the pool of potential borrowers, they may not have adequate information concerning the creditworthiness of individual borrowers. This may result in unfair practice of selecting borrowers as some borrowers may be deselected and forbidden to borrow. A simple model permits us to examine the consequences of adverse selection in credit markets. This section describes a competitive equilibrium with adverse selection. We may also argue how adverse selection can operate to effectively exclude some borrowers, despite the fact that these same borrowers could profitably borrow if lenders knew about their creditworthiness. In fact, it is the "good" borrowers, with access to relatively safe land, who do not borrow. In this case, the seminal work of the Stiglitz-Weiss provides a simplified version of credit rationing model to show how credit rationing can emerge in the absence of government regulation of interest rates (Stiglitz and Weiss 1981).

We, therefore, have assumed a potentially important source of credit market fragmentation—informal lenders themselves probably do not have access to a smoothly operating capital market. Even with this assumption, we will see that fragmentation occurs. Our argument further can be seen under Competitive Equilibrium with Complete Information and Competitive Equilibrium with Adverse Selection.

There are a number of important implications of the equilibria, which should be worth emphasized. First, when lenders have incomplete information, the terms at which credit is available to a particular borrower depend not only on her/his own creditworthiness, but on the creditworthiness of other potential borrowers in her/his locality. A borrower with a particularly safe, high return project may not have access
to credit because she/he cannot convince lenders of her/his good qualities (after all, all potential borrowers claim that their projects are particularly safe and high-yielding). Second, the problem of adverse selection can lead to credit rationing even in the absence of government interest rate controls. Third, information barrier can inhibit the integration of credit markets. Lenders with access to relatively cheap funds may not be able to fully penetrate local markets because they cannot distinguish between relatively low- and high-risk potential borrowers. Credit markets, therefore, are segmented by the pattern of the flow of information. All of these considerations apply a priori to formal sector lenders expanding into new markets, where their access to information is likely to be poor.

Much remains to be learned about the effect of inadequate information on African informal financial markets. Information flow between lenders and borrowers is crucial. It would be valuable to document information flows between borrowers and lenders and must be documented. Are financial transactions affected by adverse selection of borrowers? Is the pattern of financial transactions influenced by the lack/availability of information? The predominance of transactions amongst relatives and friends might be a reflection of information advantages, or it might be a function of imperfect contract enforcement (see below), or it might be serendipitous. If it is a reflection of information availability, it does not bode well for the expansion of formal financial institutions, which are likely to be at a disadvantage vis a vis the availability of information.

Finally, the economics of lack of information highlights the essential role of institutions and local variations. Small changes in the pattern of information availability can be associated with large changes in the pattern of financial sector activity. For example, the availability of collateral (perhaps because a region is densely populated and can support an active land market) can largely alleviate problems of asymmetric information. Alternatively, an active migratory labour market can compound adverse selection problems. Consequently, patterns of borrowing and lending may be very different in different regions. Generalization is not advisable, so localized research efforts must be promoted.
3. METHODOLOGY

The study was conducted in Shebedino and Sodo woredas of Sidama and Gurage zones respectively. Two stages sampling method was used for this study. At the first stage, two rural and one urban kebeles were purposively selected in each district. The sample kebeles were purposively selected using criteria, such as presence of informal money-lenders, and whether microfinance institutions (MFI) operate in the PA or not. Accordingly, one PA in a district where MFI operates and one where there is no MFI, and one urban kebele from each of the district towns were selected. From Shebedino Woreda, Telamo Kentise, Alawano, and Leku 01 kebeles were selected while Genete Mariam, Gogetti, and Kella 01 Kebeles were selected from Sodo Woreda. At the second stage, 30 borrowers from informal sources and 15 informal lenders were listed and interviewed. One hundred eighty four borrowers and 88 private money-lenders were interviewed using questionnaire survey. The study was conducted in November 2004.

Moreover, key informants from various socio-economic backgrounds participated in Focus Groups Discussion (FGD) in each kebele. This paper presented the results of the PRA method.

4. TYPOLOGY OF INFORMAL FINANCIAL SERVICES DELIVERY

In Ethiopia, Mauri (1987), Aredo (1993), Solomon (1996), Tesfaye (1994) and (Worku, 2000) identified a number of informal financial organizations. The most important of these are the mutual assistance associations, called Iddir and rotating saving and credit group, called Iqqub. Many groups come together in order to provide wide ranges of mutual assistance, but, in the end, these are dominated by the provision of financial services to members. This is true for many other group-based schemes in sub-Saharan Africa. Indeed, many groups that fall under the third typology of informal financial units have been created by members to primarily encourage mutual assistance, not necessarily financial. The Iddir in Ethiopia embraces family or ethnic groups that seek to support each other in times of personal or household crises. They are designed to perform mainly an insurance function. The
variation in the types of informal financial units derives from the fact that such units are purpose-oriented. Thus, depending on the socio-economic goals of communities, institutions are developed to meet the demand for specific financial services.

4.1. Informal Credit Services

Four categories of informal finance are classified in the literature (Ghate et al., 1992). These include intermittent lenders such as friends and relatives, professional money-lenders, pawnbrokers, indigenous bankers and financial companies, tied credit, such as trade credit; and saving and credit groups in which individuals pool their savings for distribution among the group members. Under the Ethiopian condition, the informal credit institutions could be grouped into four broad categories, namely (i) intermittent lenders such as relatives and friends who lend in cash or in kind with the major purpose of social support; (ii) untied credit from money-lenders who usually lend goods, grain or cash for business; (iii) tied credit or interlinked credit in which cash or goods are loaned for cash or other products; and (iv) informal associations such as Iddir and Iqqub which are saving and credit groups established to provide economic and social services to group members.

4.1.1. Credit from Relatives

Intermittent credit takes place between friends and relatives who have social ties. Lending is usually intermittent and sometimes reciprocal involving lending in cash or in kind. Loans extended by friends and relatives account for an important share of the volume of informal credit and number of loans since such loans tend to be relatively small. They usually carry no interest charges, involve no collateral, have open-ended repayment terms and may evolve into grants and equity participation (Ghate et al., 1992). In most cases, such loans are of small size (often less than Birr 50) and for a short period, often less than a month. Intermittent loans usually involve unwritten reciprocity obligations. That is, the borrower implicitly assumes the responsibility of helping the lender sometime in the future should their fortunes reverse.
4.1.2. Money-lenders-Untied Credit

Money-lenders enter into informal financial markets to make business by collecting interest on loans. In most cases, money-lenders are part-time lenders who supplement their income through money lending. Usually, they have long-standing relationship with their borrowers and are well informed about them.

In the study area, the money-lenders are farmers, shopkeepers, salaried employees and businessmen who participate in the informal finance by providing loans in one of the three forms of loans discussed below. These are:

- Cash-for-cash lending,
- Commodity-for-cash lending, and
- Cash-for-land use credit.

**Cash-for-cash lending** involves a lending practice in which money-lenders extend loan in cash and collect repayment in cash. Interest on the loan is computed on monthly basis and it is to the advantage of the lender to extend the loan period. In such a practice, the interest charge ranges from 50 to 100 per cent in six months or 5-15 per cent per month.

Moreover, cash loan is specifically given for one-market-day: Principal plus interest is collected at the end of the day. This type of loan attracts an interest rate of five per cent per day. In Kella town, such kind of loan usually takes place between November and March. It is a loan given by money-lenders to borrowers who have good reputation. Thus, loan transactions are carried out without the need of collateral or written agreements. Such a credit is given on market days for traders who purchase grain or honey and resell it on the same day. The lender can provide up to Birr 3000 per client. In the study area there are about 10 such lenders, each with about 10 clients. The critical period of liquidity problem i.e. July to October is when such a loan is highly demanded.

**Commodity-for-cash lending** is lending grain and collecting cash as repayment. This type of credit is given by shopkeepers to salaried employees, who settle their debt at the end of the month, or to small-scale traders who lack the capital to start business. Such business people are mostly women who process the grain into food
or alcohol and pay the principal and the interest at the end of the loan period, usually one week. The interest rate is about 5% per week.

**Cash-for-land use (Weled'aged) lending** is another type of credit service provided in rural areas. It is a type of borrowing money from private money-lenders by transferring use-right of part of the borrower’s landholding to the lender until the loan is fully repaid. Usually it takes five to ten years to regain the land.

### 4.1.3. Money-lenders-Tied Credit

In a tied credit, the transaction takes place between borrower and lender who are connected in an essential way with simultaneous transactions in other markets (Ghate et al., 1992). In urban areas, interlinked credit may be associated with input procurement in such a way that farmers receive loans to acquire production inputs and the lenders receive the products and advance their business. In urban areas, the predominant linkage in the informal credit is that of credit associated with product markets.

In Sodo district, for instance, lenders provide grain and collect the principal and interest in grain form. Grain-for-grain credit is usually practiced when the borrower, usually the farmer, encounters shortage of finance to purchase seeds. The lender gives one quintal of grain and receives two quintals of same after harvest. In Shebedino district, on the other hand, this type of lending involves cattle-for-fattening. This is a special case of loan in which the lender lends cattle to the borrower who feeds the animals, fatten them and sell to share the profit with the money-lender, after paying the principal back. Profit is shared equally. As an example, money-lender purchases an ox for Birr 500 and gives it to the borrower. A profit margin of about Birr 400 is shared in four months. The lender collects an interest of 8% per month. This type of loan lacks of clarity in handling risk associated with loss.

Another tied credit in Sodo district is associated with lending cash to collect grain, especially white teff. Traders are the major lenders who would like to ensure supply of grain at lower cost for their business. In this case, lenders extend Birr 120 to 150 in June/July and collect one quintal of white teff in December after crop harvest. The price of one quintal of teff is about Birr 250 in December and 320 in July in Kella town. The lenders gain 23 per cent per month from such a credit system, which is
very high as compared to the interest charged through cash-for-cash type of lending. The cash-for-white teff type of credit is not popular and its trend is declining overtime. Written agreement is necessary for such kind of loan.

Equivalent to the cash-for-white teff credit in Shebedino district is "Qarche", coffee buying. It is lending of cash to collect the principal plus interest (embedded in the price) in the form of coffee after harvest. The money-lender provides credit in cash when the coffee plant is flowering, usually in April. The coffee plantation is demarcated and used as collateral for the amount received. Basically, it is a sort of future purchasing of coffee at lower price to compensate for the opportunity cost of the capital. Accordingly, coffee on each tree is estimated at about Birr 10, which can be realized at Birr 13 after harvest, yielding 30% return in 8 months.

4.1.4. Iddir as An Informal Credit Association

Financial relations based on reciprocity or rotating saving and credit associations may exist between two or more individuals and transactions take place without intermediation by professionals. This type of financing is generally embedded in more or less traditional relationships. Such transactions may range from rather unspecified commitment, such as the provision of labour to a neighbour or relative in case of illness on mutual understanding that the other party will reciprocate in the future if required, to a written agreement in which the amount loaned and repayment date are indicated. In Ethiopia, Iddir and Iqqub are the two most important informal organizations based on pre-established social ties.

Iddir is a typical traditional organization that aims at providing assistance to its members at times of mourning. It is an informal financial and social institution, which is the most ubiquitous throughout Ethiopia (Dejecne 1993). Mauri (1987) also defined Iddir as an association made up by a group of persons united by ties of family and friendship, by living in the same district, by job, or by belonging into the same ethnic group and as an object of providing mutual aid and financial assistance in certain circumstances. In this sense, Iddir is a sort of insurance programme run by a community or a group of people in times of emergency.
Nowadays, Iddir provides a wider range of services including financial and material assistances and consolations to a member in the events of difficulties as well as entertainments as the case may be (Salole 1986).

In the study area, each member of the Iddir contributes a fixed amount, ranging from BIRR 1 to 5 per month. Members get the stated social services and economic benefits. The economic benefits could be in the form of contribution during the death of a family member as well as having access to getting credit. Two types of getting credit exist. The first one is when everyone needs cash during the stress season, mainly in July. In this case, every member will agree to borrow from his Iddir savings at an interest rate of 10% for a period of 6 to 8 months. The second type is individual borrowing in which only interested members apply and get credit.

Everyone who receives loan should sign and provide personal guarantor as a commitment to pay it back. Failure to repay leads to cancellation of membership, which has social consequences. Social ties and Iddir by-laws are loan enforcement tools. Iddir credit is highly flexible. Some members cancel collection of credit if they have sufficient savings to meet the original objective of the Iddir. Some also provide interest-free credit (e.g. Medhane-Alem Iddir in Gogetti-2 PA) while others charge up to 50% interest in 6 months period.

A case study of an Iddir in Sodo woreda is presented below.

**Case Study # 1. Interest Free Loan from An Iddir in Sodo Woreda**

Medhane Alem Iddir is a welfare association established by community members in Gogetti 2 PA. Its main objective is consoling family members of a deceased member by providing BIRR 350 and 150 kilograms of wheat at the death of a husband or wife, and BIRR 250 and 100 kilograms of wheat at the death of children.

The Iddir consists of 220 member households, out of which 50 are female headed. Each member contributes BIRR 15 and 15 kilograms of wheat per year. An additional five kilogram of wheat and BIRR 5 is collected from every member if an extra person dies.

If the number of deaths is smaller than usual, the Iddir saves cash and grain which it then lends to its members on credit base, free of interest. Repayment is made in November/December. The cash and grain are usually disbursed among members and recollected as repayment in
November/December. The Iddir has bi-laws for collecting repayment. This includes fines in cash for not repaying the loan and may end up in expulsion from the Iddir.

4.1.5. Iqqub as An Informal Credit Association

Iqqub is a sort of rotating savings and credit association. Members of Iqqub contribute to a common pool and collect funds by drawing lots. Iqqub provides credit services in an indirect way. In the study area, Iqqub selling is another type of credit when one sells out his/her turn to the other member who needs the cash for some urgent purposes. At a previously agreed interval, the lottery is also sold by the Iqqub itself to raise money for the association. Individuals sell their turn at a profit of 15-20 per cent while Iqqub sells a share at 7-10% profit. At Kella town there are different Iqqub groups having capital ranging from Birr 2000 to 30,000. One Iqqub share in this case is Birr 312 per week and it has 104 members. Four of the Iqqub shares belong to the Aksiyon. At the end of the rotation, the share of the Aksiyon and the profit accrued from sales of lotteries are divided among the members.

4.2. Informal Saving

The informal saving includes saving at home (privately managed) with relatives and informal saving groups, such as Iqqub, Iddir, and Festivals/ Meskel Aksiyon. The following section describes the different forms of informal savings experienced in both urban and rural areas of Ethiopia.

4.2.1. Privately Managed Informal Saving

The volume of saving of households at any particular time is limited. Besides, there is a tradition of keeping money at home for maximum privacy. Because of these and other reasons, most of the savings of households are managed by the owner himself/herself. This type of saving includes cash saving and saving in kind. Cash is the most liquid asset, which could be used for future consumption or investment. In rural Ethiopia, cash is saved at home, which is the most common way of saving. Cash money saved at home can be used for the purchase of livestock, contracting of land for use, purchase of jewelleries, construction of houses and speculative purchase of grains. It can also be lent to others to fetch interest.
4.2.2. Rotating Saving Association - *Iqqub*

*Iqqub* is one of the most common traditional practices of saving cash for future investment in most parts of Ethiopia. Cash is contributed by *Iqqub* members every fixed day in a week or a month in successive rounds and given to a member after drawing a lottery. *Iqqub* has fixed number of members ranging from 10 to 100 in the study area. It is initiated by a needy person who requests friends or neighbours or relatives to set up an *Iqqub*. He is given the first draw and is called "*Iqqub Sebsabi"*, the collector. Usually, the *Iqqub Sebsabi* is the "*Iqqub Danya"*, the *Iqqub* judge. If members are lucky to get the *Iqqub* at an early stage, they will be able to expand their business or start a new business. *Iqqub* is often a gender-based association in which men and women form distinct groups of their own. In women's *Iqqub*, the contribution can be in the form of cash or butter or cheese. The butter or cheese is sold to generate income for members, on a rotating basis. Usually the lottery is drawn on a market day. The contribution made in men's *Iqqub* is generally larger than that made by women.

*Iqqub* is a rotating type of fund raising and one does not entertain any fear of loosing his money because of the social ties and collateral security associated with *Iqqub*’s functioning. When a member gets the money, another member, who has not collected his/her share, will be his guarantor. The guarantor is liable to pay the member's debts in case he fails to meet his obligations.

The amount of cash in an *Iqqub* ranges between Birr 500 and 5000 in Leku town. The case study of an *Iqqub* is presented below:

**Case Study #2 Functioning of Iqqub as Saving Group in Shebedino Woreda**

W/o Birke Haile is an Amhara woman living in Leku town, Kebele 01. She is the leader of women's *Iqqub* (*Iqqub Sebsabi/Danya*). She manages two *Iqqub*s for two women groups, the "Thursday Iqqub" and the "Sunday Iqqub". There are 41 women in the "Sunday Iqqub". The Sunday *Iqqub* has 44 lots: Forty one lots belong to the *Iqqub* members, two lots are for "Aksiyon" i.e. for group's saving and the one lot is for the *Iqqub* secretary, who is freely given for his services without any cash contribution.
to the Iqqub from him. Each member contributes Birr 21 every Sunday. That makes the total value of Birr 903 per week. The chance of getting a lot is one in forty four. That means the Iqqub ends after 44 weeks. The two Aksiyon lots belong to the Iqqub members and are distributed to all members equally after the end of the cycle.

The Iqqub has one sebsabi, and a secretary. These are the leaders of the Iqqub. The Iqqub has its own by-laws iqqub. The by-laws comprise of (i) Fines for delay of payment. If a member of the iqqub arrives after the lot is drawn, he/she is fined one Birr. If someone delays payment by more than one day (up to one week), then he/she will be fined two Birr. (ii) Every member who wins the lottery should call a guarantor from those who did not get the Iqqub lot yet. (iii) The guarantor is responsible to pay the member’s debts, if the member defaults.

4.2.3. The **Iddir** – Social Insurance

**Iddir** is an informal association established by community members to provide social security during certain specified types of crisis occurring to its members. There are about four kinds of **Iddirs** in a kebele or PA. Women and men form separate **Iddirs** of their own. Primarily, the **Iddir** members agree on the duties and responsibilities of members. **Iddir** is administered by elected members and the social tie existing amongst the members of the community is the strongest factor for the successful functioning of the **Iddir**. The executive members of **Iddir** comprise of a chairperson, cashier, secretary and a public relation officer, who is responsible for communicating information pertaining to the **Iddir** to its members. Rules and regulations of the **Iddir** are also enforced by the kebele or PA administration.

In some areas, **Iddir** also provides credit service over a short period of time for a seriously sick member of the **Iddir**. In this case, too, the client should follow the regular procedure of processing loan. Moreover, the **Iddir** in rural areas provides limited credit to its poor members.

In the SNNP, the typology of informal finance is quite diversified. For example, **Meskel Aksiyon** is a type of **Iddir** established for special purposes. **Meskel Aksiyon** is one of the mechanisms of collecting and saving cash for the purchase of meat during **Meskel**, Christmas, and Easter Festivals. **Aksiyon** is most common both in rural and urban areas in Sidama and Gurage zones. Neighbours and friends contribute cash.
ranging from Birr 2 to 10 every week. Contribution can also be made in grain. The cash contribution is a continuous process as long as the members are in a position to pay. Eventually, an ox is bought and slaughtered and the meat is shared among the members. Usually, one ox is enough for 6-12 households.

5. SIZE AND SHARE OF INFORMAL LENDING

Higher proportion of borrowers (80 per cent) get loan from informal finance in rural areas than in urban areas (40 per cent) in the study area (Figure 1). This shows that the loan size per client is smaller in rural area than in urban area. This result is consistent with earlier findings in Ethiopia (Dejene 2004; Mauri 1987; Worku 2000).

According to the proportionate pilling exercises with groups of money-lenders and borrowers in Telamo Kentise and Alawano PAs, the informal finance accounts for 92 per cent in terms of number of borrowers while it is about 59 per cent in terms of total loan disbursement in year 2003/2004. This means about 92 per cent of the borrowers get credit from informal finance and 59 per cent of the loan is from informal finance in both PAs. In Sodo Woreda, about 38 per cent of the loan comes from informal sources while 62 per cent comes from formal sources in rural areas. On the other hand, in towns like Kella, 80 per cent of the loan comes from informal sources (Figure 1).
Figure 1. Proportion of Formal and Informal Credit in No. of Borrowers and Volume of Loan in Sodo District


6. CHARACTERISTICS OF INFORMAL CREDIT

6.1. The Informality of the Informal Finance

The procedures for loan acquisition include verbal application to private money-lenders. The borrower directly goes to the money-lender and explain his/her problem and request for loan. A Creditworthy borrower can get credit immediately without much ado. This could happen when the borrower and the lender have established good relations in the past. Otherwise, the lender tells the borrower to return after 1-3 days in order to gather adequate information about the creditworthiness of the borrower.
If the borrower is found to be creditworthy, the lender asks him to bring a guarantor. For small loans, like Birr 10 or 20, a guarantor may not be required. If the loan is relatively higher, the borrower has to bring either a guarantor or has to agree to give use right of assets, such as coffee plantation, livestock or land. In all cases, the borrower has to enter into a written agreement. The interest is not mentioned in the agreement as it is, on the outset, added up into the principal. For instance, if someone borrows Birr 100 and the interest is Birr 50 after five months, the contract agreement will be stated as if the borrower had initially received Birr 150. A borrower is expected to explain to the lender for what purpose he wants the loan. The lender may not sanction the loan if he is not convinced of the borrower’s explanation.

6.2. Collateral

Depending on the relationship between the lender and the borrower, usually money-lenders demand assets such as houses, shops, livestock, land, or personal guarantor. If a good relationship exists between the lender and the borrower the loan transaction may be executed on mutual trust only. In most of the cases, however, a borrower is required to bring a guarantor. The guarantor is expected to be dependable and of good reputation and relatively wealthy.

Case Study #3: Case Study of Cash Loan Using Land as Collateral

Ato Awal Mohammed is a farmer living in Gogetti-3 PA in Sodo district. He has five children. He owns one hectare of land, although half of the landholding is used by a money-lender. He borrowed Birr 600 about ten years ago by pawning 0.5 hectare of his land to a local money-lender. The agreement reached between Ato Awal and the local money-lender was that the lender uses the land until Ato Awal repays back the borrowed money. The loan does not bear interest as long as the lender uses the land (it is called Weleda’aged meaning does not bear interest for borrowed money). During the first five years, Ato Awal could not repay the loan. Then he asked the lender to lend him an additional Birr 600 on the understanding that the lender will use the land until the borrowed money (now Birr 1200) is repaid. The land is legally under the borrower’s name and he pays government tax for the land. Ten years have already elapsed and unless the borrower pays back the total sum to the lender, he will not get back his land. The yield from the 0.5 hectare of land is estimated to be 5-6 quintal of teff (one quintal of teff is costs about 230-240 Birr). The lender could get back his money in two years time by growing teff.
Ato Awel said that he would prefer to contract out his plot of land in a yearly basis (they call it "Berer") rather than the "Woleda'aged". This is because, in "Berer" the landowner could contract 0.5 hectare at Birr 600-800 per year. If the landowner wants back his leased land, he has to inform the lessee in advance about his intention. Woleda'aged does not make such a provision. Unless the loan is repaid, the landowner cannot claim his land back. As Ato Awel could not pay the loan, the land is currently used by the money-lender. According to Ato Awel, he regrets entering into such "Weleda'aged" type of money borrowing. These days, "Weleda'aged" is being replaced by "Berer".

These days, in Sodo Woreda money-lenders are opting for land to be used as collateral. In case of default, the lenders are entitled to use the land by estimating the lease price of the land. Land rent/lease price is about Birr 1600 per hectare per year in Sodo Woreda. The conditions of using the land/assets are specified in the loan agreement.

6.3. Purposes of Informal Credit

Informal credit is used both for consumption and income generating purposes in the study area. According to key informants, loans are used for the purchase of seeds, food items, herbicides, medical expenses, financing of trade/business, and for covering children's educational expenses. According to the FGD, lenders have two objectives in mind when lending. Firstly, they are helping their fellow community members in time of need and secondly, they are benefiting themselves from the interest on loan.

6.4. Borrowers' Perceptions of Informal Finance

In all the study areas, borrowers have positive opinion about private money-lenders. The majority of the borrowers consider money-lenders as "Yequrti Qen Derash" (meaning, the one who helps in time of need or trouble). Borrowers in Gogetti-2 PA have confirmed the above assertion. Borrowers perceive money-lenders as partners who are ready to help them when they are in trouble. Borrowers are aware of the fact that they can only find such support, with minimum transaction cost, only from private money-lenders.
6.5. Flexibility of the Informal Finance

In general, borrowers believe that the informal credit system is more flexible than the formal credit system. The informal finance is highly flexible in terms of interest charges and rescheduling of loan repayment period, based on the request of the borrower. Non-professional money-lenders are those who see lending money as welfare work. Many rich and religious persons also lend money not for the interest it accrues but for the respect they get from society.

The loan repayment period can be flexible and rescheduled upon the request of the borrower and consent of the lender. It can be extended for another one or two years. In most cases, the money-lenders are willing to extend the repayment period as long as they are certain their money will eventually be repaid. A new agreement is made for the rescheduling of debt repayment. If the borrower fails to repay his debts, he/she will give part of his/her coffee plantation or other collateral to be used by the lender for a specified period of time. There are instances where total ownership of the collateral is transferred to the lender, based on the estimated value of the asset and the amount of money lent, if the borrower fails to meet his obligations.

6.6. Enforcement Mechanisms for Loan Repayment

In the study areas, majority of borrowers repay loans because they know they have to do so if they are going to get another loan in the future. The written agreements, the personal guarantor, and the by-laws of Iddir are all used as legal evidences of suing the defaulter at appropriate social or formal court. Other enforcement mechanisms for loan repayment include performance of a vow, arbitration through elders, and court of law.

**Case Study # 4: Example of Enforcement of Loan Repayment**

Ato Tekalegn Atero is 48 years old and has seven family members. Ato Tekalegn is living in Gogetti-3 PA. He has 0.75 hectare of land. Ato Tekalegn has been borrowing 500 Birr, at 100% interest rate, every year from two or three private money-lenders for the last ten years. He used to repay Birr 1000 (100% interest rate) within six to eight months after he took the loan.
For Tekalegn, the collateral for borrowed money is his land. He signs agreements with money-lenders. The lenders can use the land under collateral, if the borrower fails to repay the principal plus interest. Ato Tekalegn has paid all his debts as scheduled fearing not to spoil the good relation he has with his money-lenders. His trustworthiness has helped him get loan every year. Ato Tekalign knows well that if he fails to repay his debts he will lose his land.

6.7. Potential Linkages between Informal Lenders and Microfinance Institutions

Some of the lenders who lend money merely to help borrowers and not to benefit themselves consider microfinance institutions and saving and credit cooperatives as partners. Such kinds of lenders are happy whenever lending institutions enter into money lending business in their community. On the other hand, there are few private lenders who see MFIs and saving and credit cooperatives as competitors. In any case, the advent of formal financial institutions, such as MFIs and saving and credit cooperatives would contribute to the advancement of loan services.

In the study areas, there is no formal relation between informal lenders and MFIs. However, in some places, some borrowers are clients of both informal lenders and MFIs. It is alleged that some borrowers borrow cash from private money-lenders to repay MFI's loan.

It was noticed that private money lending is not a growing business. The usury law has hindered its growth. The majority of private lenders are operating underground due to the usury law that prohibits usury.

The potential linkage of informal finance with microfinance institutions could be through strengthening the capacity of Iddirs and Iqquibs for re-lending money. Training could be given to Iddir and Iqquib leaders and loan could be extended through Iqquib and Iddir, on one hand, and through saving and credit cooperatives, on the other.
6.8. Interest Rates of Informal Credit

Monthly interest rate charged by various lenders is computed from the information obtained from the key informants during the field survey (Figure 3). According to data shown in Figure 3, cash-for-white teff lenders charge the highest interest rate (23%) followed by one-market-day loan (20%). Loan from relatives/friends is usually interest free (Figure 3). Cash-for-cash lenders charge 16 per cent interest rate per month. The interest rate of grain-for-grain credit is about 16 per cent per month. Loans from Iqquib, Iddir, Cooperatives, OMFI, and Extension Packages draw lower than two per cent interest rate, which is much lower compared to that of private lenders.

![Figure 3. Monthly Interest Rates Charged by Private Lenders by Forms of Credit](image)


In Sodo Woreda, private money-lenders charge 100 per cent interest in six months. They disburse cash usually in June/July and collect repayments in November/December. Money-lenders purchase grain during December when grain price is low and sell it in June/July when the price is high. As a result, lenders prefer
The Role of Informal Finance in Rural Economy: The Case of Gurage and Sidama ...  

... to invest their cash on grain trade than to lend it between December and June. The lenders resume lending in June/July.

On the other hand, private money-lenders charge 5-10 per cent interest per month at Genete Mariam PA, in Sodo Woreda. They disburse loan in June, September and November. The June/July loan is used for purchase of agricultural inputs and consumption. The loan disbursed in September is used for Meskel Festival and that of November is used for purchase of grain and other business activities. According to the key informant, the relationship between the borrower and the lender and the demand for loan determine the interest rates. If the two parties have good relation, the rate of interest could be low. Furthermore, if there is high demand for loan, interest is high.

7. BORROWERS' PREFERENCES

Participants of the FGD in Kella town in Sodo district expressed their preference to sources of credit using matrix-ranking exercise. The key informants used criteria, such as ease of acquiring loan, sufficient time for loan repayment, easy collateral requirement, low interest rate, relatively big amount of loan, and promoting savings.

Based on the above criteria, the key informants expressed that loan from relatives/friends is the most preferred source. Loan from Self Help International is the second most preferred source (Table 1).
### Table 1. Borrowers' Preference for Sources of Credit in Kela Town

<table>
<thead>
<tr>
<th>Lenders</th>
<th>Easily accessible for loan</th>
<th>Sufficient time for loan repayment</th>
<th>Easy collateral requirement</th>
<th>Low interest rate</th>
<th>Relatively big loan size</th>
<th>Promoting savings</th>
<th>Score</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMFI</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>31</td>
<td>4th</td>
</tr>
<tr>
<td>SHI- SACO</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>35</td>
<td>2nd</td>
</tr>
<tr>
<td>Private Money-lender</td>
<td>8</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>8</td>
<td>3</td>
<td>30</td>
<td>5th</td>
</tr>
<tr>
<td>Equib</td>
<td>7</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>32</td>
<td>3rd</td>
</tr>
<tr>
<td>Relatives/friends</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>1</td>
<td>36</td>
<td>1st</td>
</tr>
<tr>
<td>Ordinary loan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>18</td>
<td>7th</td>
</tr>
<tr>
<td>Package/rural women's credit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash for Grain</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>19</td>
<td>6th</td>
</tr>
<tr>
<td>Grain for Grain</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>15</td>
<td>8th</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
<td><strong>36</strong></td>
<td><strong>36</strong></td>
<td><strong>36</strong></td>
<td><strong>36</strong></td>
<td><strong>216</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Own Survey, December 2004.

However, looking into the specific criteria, private money-lenders are the most preferred source of credit as far as the ease of accessibility to loan and amount of loan are considered. On the other hand, saving and credit cooperatives are the most preferred sources of credit as far as the length of repayment period is concerned in Sodo Woreda.

### 8. CONCLUSION

Regardless of the presence of usury law in Ethiopia, informal finance is functioning in rural and urban parts of the study areas. It is a multi-purpose activity dealing with consumption, trade, production, and services. The 1957 usury law should be revised and respond to the prevailing realities on the ground.
Informal finance takes shorter time than formal finance to process loan. Loan acquisition from informal finance is quick, easy and flexible and with less transaction cost for the immediate needs of borrowers. Informal finance is based on individual lending rather than on group collateral approach. Most of the key informants in the study have expressed their preference to informal finance to receive loan. Repayment period of the loan from informal finance is highly flexible and could be rescheduled on mutual agreement.

Personal trust, guarantor and land are important elements in the process of loan disbursement in informal finance operations. Land is a valuable asset, which can be used as collateral for farmers to get loans whenever they need one. Farmers want security of tenure, as land is the most important asset for them. Hence, it is high time that the Government revisits the land tenure policy.

Informal finance operates everywhere, including in very remote areas. Borrowers are willing to pay interest rates of 5-15 per cent per month from the informal sector. This shows that there is unmet demand for credit in the study areas. The rotating saving and credit associations have flexible elements of saving and credit functions, which can be capitalized on to enhance financial services to the poor.
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PART V

NATURAL RESOURCES AND COMMERICALISATION OF SMALLHOLDER AGRICULTURE IN ETHIOPIA
LAND TRANSACTION AND MARKET-ORIENTED PRODUCTION: 
THE CASE OF EAST SHEWA ZONE, ETHIOPIA

Bezabih Emana*, Kajela Gamtessa**
Melaku Jirata+ and Hedija Mohammed++

Abstract

The article analyzes the role of land renting in increasing agricultural production and its contribution to market orientated production. A total of 158 farm households were interviewed using structured questionnaire to collect the necessary data during 2004. The production data and land renting information used in this study refer to the 2003 production year.

The descriptive analysis shows that about 3% of the sample households who rent in land own no land, and about 17% of them own only less than 1 ha. Most of such farmers are young and newly established households. These farmers are relatively educated and innovative in making decisions. The agricultural extension system of the country targets farmers who own land and pay land use tax. That means, the landless agricultural producers have less or no access to extension service through which yield-increasing inputs, such as fertilizer and improved seeds, are distributed.

Despite the size of land owned, the households who rent in land operate larger size of land and engage in the production of commercial products, such as teff and haricot beans than those farmers who operate only own plots. Those operating only on their plots emphasize on production for subsistence. The decision on the choice of enterprise by the farmers depends on the profitability rather than on technical yield level only. Farmers who rent in land earned about 4300 Birr from sales of crop products, which is twice that of farmers who operate only on their plots.

Logistic model was fitted to identify socio-economic factors that determine the decision to rent in land. The result shows that, as land owned gets smaller and family size increases, farmers opt to acquire land through land transaction and renting. Moreover, age of the farmers and renting in land are inversely and significantly related. The policy implication is that the alternative land use policy that

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++ Federal Cooperative Commission
allow land transaction encourages innovative and landless farmers to acquire land and increase supply of marketable products.

1. INTRODUCTION

Agricultural land is a fundamental source of income and livelihood for the rural population. Ethiopia is endowed with large area suitable for agriculture, which amounts to about 11.05 million hectares. The land is suitable for the production of temporary/annual crops and permanent crops whereas communally owned land is suitable for extensive livestock production. Over 73 per cent of the agricultural area of Ethiopia was used for temporary crops production in year 2001/02. However, farming is dominated by smallholder agriculture and farm size is declining and fragmented; natural resources degradation is alarming.

Land tenure system is one of the many tools used to regulate society. The debate on the effect of land tenure system is controversial. On the one hand, poor land tenure is blamed for relatively slow growth in agricultural development which can emanate from frequent land allocation by local leaders creating problem of insecurity (Johnson 1995). Poorly defined land rights may directly reduce production since farmers may be unable to access credit without the use of their land as collateral (Basely 1995). Experiences elsewhere, e.g. in China, indicate that the right to use land for longer or indefinite periods of time encourages use of land saving investment (Li et al., 1998). Moreover, a well-defined land right promotes land transaction by encouraging land renting.

Supporters of government intervention in land tenure system attribute low agricultural growth to market inefficiencies rather than land rights. They argue that privatisation of land rights will lead to socially dangerous situations, in view of the weak credit system and inefficient markets prevalent in the country. Empirical evidences are not available to justify such an argument.

Ethiopia had experienced different types of tenure systems. In the following section, a brief analysis of the major tenure systems relevant to land market will be reviewed.
2. EVOLUTION OF LAND MARKET IN ETHIOPIA

The land tenure system has been the issue of power and governance in Ethiopia. Land tenure systems evolved in response to political environment, rural demographic dynamics, expansion of markets, natural resource conditions, and social and physical infrastructure (Ahimed et al., 2002). Historically, the land tenure system of Ethiopia can be broadly classified into three: (i) the feudal land tenure system, (ii) the state ownership of the socialist system and (iii) the semi-liberal and market-oriented system adopted since 1991. Each of the tenure systems has its own peculiar features regarding forms of land transaction. According to Desalegn (1984), the land tenure during the feudal system could be characterized by usufructuary and private tenures. The usufructuary tenure system includes the *rist*, *semon* and *maderia* or *yemengist* forms of landholdings.

The *rist* is a right, which the *rist* holder can claim a portion of the land from his/her ancestors, who originally held the land. This claim subjected the *rist* holders to varying degrees of insecurity. Holders of the land can bequeath their holdings but could not sell, mortgage or exchange it in any form. This has been viewed as an assured access to land to all members of the *rist*. The security over the land was protected in the system through honouring hereditary rights and denying access to outsiders. Numerous claims of *rist* rights and the subsequent litigation over land parcels severely diminished security to invest in farmland and resulted in continued fragmentation of holdings (Ahimed et al., 2002).

The *semon* is a system where the church held land granted by the crown to generate financial and material support for its services. The church occupied large tax-free rural lands, which were either leased for share-cropping or rented out to local farmers.

The *maderia* or *yemengist* was a declaration of land as state property. During the feudal system, as the imperial government conquered the south, southeast, and eastern part of the country, all unsettled rural lands were declared state property and given to officials, militiamen and loyalists of the crown (Desalegn 1984). As more land was occupied, the local population became landless and, hence, tenants. The landholder has the right to transfer land through sales, mortgages or exchanges subject to payment of tax to the government.
In general, all the three forms of landholdings were similar in terms of providing use right to the holders, while the institutions which held the ultimate reversionary rights over individual holdings were different. The traditional rist system reduced the need for land markets. In the south freehold tenure dominated.

The feudal land tenure system was recognized by scholars as the fundamental obstacle to the country's agricultural development and as the underlying cause of land degradation and unequal income distribution. As the Derg regime took power in 1975, it introduced a radical land reform ending all customary land tenure systems. All rural lands were declared state property and redistributed to the tillers, on the basis of family size and quality of land, in an attempt to create equity and fairness in land acquisition. The power and responsibility to allocate land was given to local peasant associations. This way the government became the controller of the land. Membership in peasant associations was mandatory for one to obtain land.

All kinds of land transactions and wage labour in rural areas were banned. Hence, farmers could neither sell, mortgage, lease out and transfer the land allocated to them, nor use hired labour. Rents from land and farm labour markets legally ceased to exist. Land redistribution could not satisfy the rapidly growing population. As a result, informal land transaction through land leasing between close relatives and friends gradually started. The practice of lending and gifting land indicates an altruistic motive on the part of the landowners to support the incomes of their relatives and friends. In contrast to the share-cropping and fixed rent arrangements that were dominant under the feudal system, lending and gifting of land were practiced as a result of population pressure and increasing landlessness. Parents also started to temporarily give part of their lands as gift to their newly married relatives.

In the 1990s, the Derg regime issued the “mixed economic programme” that aimed at liberalizing some of the highly centralized systems of economic management and allowed a transferable and lifelong lease to holders of rural lands. Thus, farmer-to-farmer transfer of land and land contract became official. But the government did not establish legal procedures and institutional mechanisms to allow the development of formal land market (Ahimed et al., 2002).

The new constitution adopted in 1994 by the current government reaffirmed what the previous regime had established by institutionalizing state ownership of all rural lands. Article 40(3) of the new constitution declares land as a common property of the
nations, nationalities and peoples of Ethiopia and shall not be subject to sale or to other means of transfer. But, farmers have the right to use land indefinitely and lease it temporarily to other farmers and inherit to their children.

But certain issues, such as farm size and access to land, are unresolved and are under regional governments' jurisdiction. The land policy of Tigray (1997) and the land use and administration proclamation (No.56/2002) of Oromia stipulate the provision of land certification to landholders and limits distribution/redistribution of land to only limited categories of land. In Tigray, land can be leased out up to 10 years if the lessee uses modern technologies on the land he took on lease and 2 years if only traditional technologies are used (Ahimed et al., 2002). In Oromia, the policy permits leasing out up to half of the landholding for up to 15 years if modern technologies are used, and 3 years otherwise.

Due to population pressure, land contracting through share-cropping and renting is largely practiced in accordance to customary leasing practice. This practice can be considered as informal, as the leasing agreement requires the approval of a local responsible organ.

One of the major reasons for limiting land transaction is to ensure the wellbeing of the farming community through income derived from farming. Important questions, however, can be raised regarding the efficiency of land resource use vis-à-vis the transformation of agricultural practices in the country. This paper deals with the comparison of own holding and land renting and supply of marketable agricultural products.

3. PROBLEM ANALYSIS

Due to economic importance, land markets and land tenure security issues have received considerable public attention in sub-Saharan Africa (Ahimed et al., 2002). In Ethiopia, as stated above, land is owned by the government and, hence, by the public. Farmers have use rights. Basically, land is allocated to the household through the administration of Peasant Association (PA) using the criteria of duration of residence and family size. If the farmer didn't till his land for some consecutive years, his land might be given to other farmers.
As population grows, and due to the tenure system that prohibits transfer of land ownership, the pressure on land is increasing and the probability of getting land by newly emerging households is very low. As a result, farmers are opting for land through other means. Renting, sharecropping and borrowing of land (temporary permission to use land freely) are the different options of contracting land for farming. In the study area, renting of land for one or more years is a major means of contracting land and transferring use right for a specified period of time. Land contracting takes place when a landholder is in a precarious financial situation. This study deals with the role of land renting in agricultural production and boosting of marketable commodities.

It has been emphasized that in the agriculture and rural development policy of the country, land and labour are the main resources to be extensively and intensively exploited to bring about food security and marketable surplus. The objective of this paper is to analyze land transaction which farmers are using to acquire land for production of crops for consumption and marketing. The hypothesis is that land leasing enhances supply of marketable products.

4. THE STUDY AREA

The study was conducted in east Shewa zone, which is located in the central highland of the country. About 55.6 per cent of the total land area of the zone has been utilized for crop cultivation (CSA 2001/02). The study was conducted in four districts, namely Adama, Boset, Dugdabora and Adami Tullu in early 2004. Farmland is acquired in two ways in East Shewa.

The first one is where farmers own use right over farmlands and pay taxes to the government. The second one of acquiring land is through renting from poor farmers or from those who have large farm size. The great majority of poor households rent out their farmland to rich farmers in their communities. The price of land rent ranges between Birr 1200–1600 per hectare per year. Poor households rent out their farmland because of the difficulties they usually face, such as lack of oxen, seed, and sometimes labour.
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Land renting is also conducted as a means of advancing agribusiness. It has been observed during the study that, despite modest landholding size, business-oriented households rent land to produce cash crops, such as haricot beans.

5. METHODOLOGY

This study is based on the data collected from samples of farm households organized in groups by Melkasa and Adami Tullu Agricultural Research centres during early 2004. The Research centres undertook on-farm research activities. The data collected include resource bases, household characteristics, source of land cultivated by the household, land use system, sources of land used for cultivation, production system and disposal, use of commercial inputs and extension services. Qualitative and quantitative data were collected using structured questionnaire and open-ended questions. Experienced enumerators were trained to collect the data under close supervision of the researchers. In total, 158 farm households were interviewed to collect the relevant data (Table 1). Important observation, which requires in-depth analysis, is the means farmers, mainly emerging households, were using to get access to agricultural land.

<table>
<thead>
<tr>
<th>District (Woreda)</th>
<th>Number of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boset</td>
<td>28</td>
</tr>
<tr>
<td>Adam</td>
<td>44</td>
</tr>
<tr>
<td>Dugda Bora</td>
<td>14</td>
</tr>
<tr>
<td>Adami Tulu</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>158</strong></td>
</tr>
</tbody>
</table>

**Source:** Own Sampling (2004).

Moreover, group discussions were held with key informants, such as Farmers’ Association leaders and elders to gather information from their own point of view. Both descriptive and econometric analyses were made using primary data. The descriptive analysis compares the farmers who rent in land to overcome the problem of land shortage or expend the production of crops with those operating only on their
own plots. The econometric model is used to identify key socio-economic and household features that affect the decision to rent in land.

Logistic model was estimated to analyze the determinants of the probability of renting in land. Following the analogy used by Liao (1994), Gujarati (1988), and Aldrich and Nelson (1984), the logistic distribution function can be specified as,

\[ P_i = \frac{1}{1 + e^{-z_i}} = \frac{e^{z_i}}{1 + e^{z_i}} \]  

(1)

Where \( P_i \) is a probability of renting in land for the \( i^{th} \) farmer and it ranges from 0-1, \( e^{z_i} \) stands for the irrational number \( e \) to the power of \( z_i \).

\( Z_i \) is a function of \( N \)-explanatory variables and expressed as,

\[ Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n \]  

(2)

Where \( X_1, X_2, \ldots, X_n = \) Explanatory variables, \( \beta_0 \) - is the intercept, \( \beta_1, \beta_2, \ldots, \beta_n \) are the parameters.

The parameters indicate how the Log-odds in favour of renting in land situation change as independent variables change. The unobservable stimulus index \( Z_i \) assumes any value and is actually a linear function of factors influencing the decision to rent in land. As \( Z_i \) ranges form \(-\infty\) to \(+\infty\), \( P_i \) ranges between 0 and 1 and that \( P_i \) is non-linearly related to the explanatory variables. This means that the familiar OLS procedure cannot be used to estimate the parameters. In order to simplify the expression, we need to rewrite the equation in the form of odds-ratio. Accordingly, if \( P_i \) is the probability of renting in land, then \((1-P_i)\), the probability of not renting in land, can be written as:
Therefore, the odds ratio can be written as,

\[ P_i = \frac{1}{1 + e^{-Z_i}} \]  

Therefore, the odds ratio can be written as,

\[ \frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \]  

Now \( \frac{P_i}{1 - P_i} \) is simply the odds ratio in favour of renting in land. It is the ratio of the probability that the farmer would rent in land to the probability that he/she would not do so. Finally, taking the natural log of Equation 4 the log of odds ratio can be written as,

\[ L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = \ln \left( e^{Z_i} \right) = Z_i = \beta_0 + \sum_{j=1}^{n} \beta_j X_j \]  

Where \( L_i \) is log of the odds ratio in favour of renting in land, which is not only linear in \( X_j \), but also linear in the parameters. This model was estimated using the iterative maximum likelihood estimation procedure.

**Definition of Variables and Hypothesis**

The binary dependent variable: In this study, the decision to rent in land is defined as a binary dependent variable, where a dichotomous variable takes 1 for those households renting in land, and 0 otherwise.

The explanatory variables: The variables expected to influence the dependent variable are the following:
Landholding – The size of the land under disposal of the household is a key variable affecting the decision whether a farmer should rent in land or not. As the size of the holding increases, the probability that the farmer rents in land is expected to decline.

i. **Age of the household head** - As the population increases rapidly, the pressure on land and the demand for it increases. As a result, it would be difficult for the PA administration to fully accommodate the rising demand. The young and the newly married farmers should either shift their career to other sectors or involve in land transaction to engage in agricultural production. The chance of shifting to other sectors is limited. It is, therefore, hypothesized that the age of the farmer and the probability of renting in land is negatively associated.

ii. **Livestock holding** – Livestock is a means of saving in the rural area. It can provide capital to purchase commercial inputs for effective use of the rented in land so that the return over investment in rented land is high. Lack of capital, including traction power, is one of the reasons why farmers lease out their landholdings. Thus, livestock size is expected to positively influence the probability of renting in land.

iii. **Family size** – Production for subsistence is a common practice in rural Ethiopia. As the family size increases, the demand for food production increases. Unless yield-increasing inputs are used, land size has to increase with increasing family size if the food consumption of the family is to be met. Thus, family size positively affects the decision to rent in land.

iv. **Extension service** – In this study, extension service is approximated by the number of visits made by the development agent to the farmer. It is supposed that such contacts prompt the farmer to take measures that would increase production. So, one way of increasing productivity is land renting. Hence, extension service itself would have an indirect, but positive, influence on land transaction.

v. **Education** – Basically education improves the decision making of individuals. In this particular case, education may prompt newly emerging households to engage in land renting to produce and earn more or it may help them to look for other options. Hence, the effect of education cannot explicitly be determined before estimation of the model.
6. DESCRIPTIVE ANALYSIS

6.1. Landholding and Renting

As stated earlier, land is fundamental to the livelihood of the rural population. Although farmers have the right to acquire land to sustain the life of their family, the opportunity is very limited. The same land had been tilled for generation after generation and as a result productivity of the land is going down year after year. Land is scarce in areas where population is growing rapidly. In sparsely populated areas, such as the study area, moisture stress is another problem.

Young farmers mostly get land for cultivation from their parents. This, however, is very dependent on parents’ good will. Even if there is enough good will on the part of parents, the young are not getting adequate size of land to support their family. On the other hand, older farmers who own relatively larger agricultural lands are not able to cultivate their land effectively. Hence, land renting and sharecropping are common practices since these provide opportunity to efficiently utilize land.

From the 158 farm households interviewed, 51% were involved in renting in land. Those households who cultivate only their plots own an average size of 3.1 ha. The smallest size per household is half a hectare, whereas the maximum is 14.5 ha. On the other hand, those farmers who are engaged in renting in land own either no land or possess a maximum of 6.5 ha (in contrast to 14.5 ha) (Table 2). About 3% of them do not have any plot of land, while about 17% cultivate less than 1 ha of land. The difference between the landholdings of the two groups of farmers (those renting in land and those not renting in land) is significantly different at less than 5% level.
Table 2. Land Owned, Cultivated and Income of the Two Groups

<table>
<thead>
<tr>
<th>Parameters</th>
<th>No renting of land (N=77)</th>
<th>Rented in land (N=81)</th>
<th>t-value</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own land (ha)</td>
<td>Min 0.5 Max 14.5 Mean 3.1</td>
<td>Min 0 Max 6.5 Mean 2.5</td>
<td>2.14</td>
<td>0.034</td>
</tr>
<tr>
<td>Land cultivated in 2003 (ha)</td>
<td>Min 0.5 Max 14.5 Mean 3.1</td>
<td>Min 0.36 Max 30 Mean 4.8</td>
<td>-2.99</td>
<td>0.003</td>
</tr>
<tr>
<td>Total family size of the household</td>
<td>Min 2 Max 20 Mean 8.0</td>
<td>Min 1 Max 20 Mean 8.1</td>
<td>-0.08</td>
<td>0.938</td>
</tr>
<tr>
<td>Cash income from crop sales (Birr)</td>
<td>Min 0 Max 57 Mean 2130</td>
<td>Min 0 Max 55120 Mean 4387</td>
<td>-2.52</td>
<td>0.013</td>
</tr>
</tbody>
</table>


The result, however, shows that those households who rent in land put larger area under crop production and, hence, significantly improve their livelihood. Although they hold an average land size of 2.5 ha for use, the renters ploughed 4.8 hectares of land during the 2003 production year. The cash income of this group of farmers has doubled (Table 2). This implies that limiting land transaction can, to a certain degree, hinder optimum use of land and may contribute to low production.

6.2. Crop Enterprise Selection and Use of Commercial Inputs

The major objective of crop production by the smallholder farmers is meeting the subsistence requirement of the members of the household. This objective is attained through putting sufficient size of land under cultivation or using yield-increasing technologies such as high-yielding varieties and fertilizer. Knowledge of high-yielding varieties and rewarding market prices of the products is essential. In the study area, the majority of farmers interviewed grow maize and sorghum for home consumption while the other crops are mainly for sale.

To fulfil the current development objectives of the government, prioritizing production of certain crops, based on comparative advantage, is necessary. East Shewa, the study area, is known as supplier of teff, wheat, and haricot beans, among others.

Although a more thorough investigation is needed to generalize, the result of the study gives a clear picture about the fact that own landholding is not a prerequisite for increased production of the required commercial products. As shown in Table 3,
households, who rent in land, allocated relatively more land to high value crops, such as teff, haricot beans, and wheat to increase cash income and much more was planted with maize to meet the household’s food needs. This means that the aim of producing high value crops, to meet the local and export needs of the country, requires farmers’ decision making in business context, which in turn requires resource mobility from a less efficient to a more efficient group of farmers.

Table 3. Comparison of Mean Area Allocated to Crops (ha)

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>No Land Renting</th>
<th>Rented in Land</th>
<th>t-value</th>
<th>Sig. Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teff</td>
<td>0.84</td>
<td>1.49</td>
<td>-3.251</td>
<td>0.001</td>
</tr>
<tr>
<td>Maize</td>
<td>1.18</td>
<td>1.57</td>
<td>-1.241</td>
<td>0.217</td>
</tr>
<tr>
<td>Barely</td>
<td>0.29</td>
<td>0.34</td>
<td>-0.437</td>
<td>0.665</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.47</td>
<td>0.66</td>
<td>-1.153</td>
<td>0.254</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.51</td>
<td>0.59</td>
<td>-0.515</td>
<td>0.609</td>
</tr>
<tr>
<td>Haricot beans</td>
<td>0.65</td>
<td>1.17</td>
<td>-2.940</td>
<td>0.004</td>
</tr>
</tbody>
</table>


Table 4 shows the average amount of chemical fertilizer and herbicides used by the two groups of farmers. Although the difference is not statistically significant, the amount used by those renting in land appears to be higher.

Table 4. Use of Commercial Inputs (mean per household)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>No land renting</th>
<th>Rented in land</th>
<th>t-value</th>
<th>Sig. level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea (qt)</td>
<td>0.83</td>
<td>3.20</td>
<td>-1.257</td>
<td>0.213</td>
</tr>
<tr>
<td>DAP (qt)</td>
<td>4.35</td>
<td>4.35</td>
<td>0.001</td>
<td>0.999</td>
</tr>
<tr>
<td>Herbicide (kg)</td>
<td>0.70</td>
<td>2.02</td>
<td>-1.323</td>
<td>0.192</td>
</tr>
</tbody>
</table>


6.3. Market Orientation

The degree of market integration is determined by the role played by the agents in either supply or demand side. The farming community is involved in the marketing of agricultural goods. But the roles played by the different groups of households have implications for enhanced interaction in the marketing system. The point of interest in this paper is assessment of the volume of product sold in the market during the reference year.
As shown in Table 5, the volume of production of all crops considered and the amount of products sold are higher for those households renting land. This further confirms the argument of efficient land allocation through factor mobility or transfer.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Only own land</th>
<th>Rented in land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production</td>
<td>Sales</td>
</tr>
<tr>
<td>Teff</td>
<td>5.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Maize</td>
<td>10.7</td>
<td>7.5</td>
</tr>
<tr>
<td>Barely</td>
<td>3.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Sorghum</td>
<td>6.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Wheat</td>
<td>4.8</td>
<td>3.1</td>
</tr>
<tr>
<td>Haricot</td>
<td>6.4</td>
<td>7.3</td>
</tr>
</tbody>
</table>


6.4. Determinants of Land Renting

As stated above, farm households are motivated by different factors in deciding whether to rent in land or not. In order to assess the factors that may affect their decision, binary logistic model was fitted using SPSS software. The result is given in Table 6.

The overall prediction capacity of the model is 69%, indicating that given the variables included in the prediction, the probability of right prediction is 69 per cent. Four of the seven explanatory variables included in the econometric model are significant. As expected, the probability of renting in land increases as the family size increases. This could be explained by the fact that large families provide the labour needed for farming and labour cost cannot be a problem if one wants to expand agricultural land through renting. On the other hand, if a household having large family size is confronted with shortage of land, renting provides an option of acquiring land. In the long run, however, as the family size increases, land is distributed between the emerging young farmers and hence reduces own land size, but may be associated positively with rented land (De Lasson 1993).
Table 6. Logistic Model Parameters

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>Standard Error</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family size</td>
<td>0.31</td>
<td>0.13</td>
<td>0.02</td>
<td>1.36</td>
</tr>
<tr>
<td>Age of household head</td>
<td>-0.05</td>
<td>0.03</td>
<td>0.06</td>
<td>0.95</td>
</tr>
<tr>
<td>Land holding</td>
<td>-0.40</td>
<td>0.22</td>
<td>0.07</td>
<td>0.67</td>
</tr>
<tr>
<td>Frequency of DA visit</td>
<td>0.01</td>
<td>0.01</td>
<td>0.66</td>
<td>1.01</td>
</tr>
<tr>
<td>Male education</td>
<td>-0.76</td>
<td>0.34</td>
<td>0.13</td>
<td>0.47</td>
</tr>
<tr>
<td>Female education</td>
<td>-0.51</td>
<td>0.32</td>
<td>0.114</td>
<td>0.60</td>
</tr>
<tr>
<td>Livestock size</td>
<td>-0.02</td>
<td>0.03</td>
<td>0.51</td>
<td>0.98</td>
</tr>
<tr>
<td>Constant</td>
<td>3.15</td>
<td>1.25</td>
<td>0.01</td>
<td>23.23</td>
</tr>
</tbody>
</table>


On the other hand, the probability of renting in land has an inverse relationship with the age of the head of the household, size of landholding, and education of male-headed households. Visits by the development agent and livestock size appear to be not significant factors affecting the decision.

7. CONCLUSION

Land renting appeared to have significant impact on the amount of land allocated to high value crops and food crops. Younger farmers are using land renting as a means of getting access to farming. Rented land is allocated more to marketable products, which contribute to poverty alleviation and rural development. This has policy implication regarding land tenure and use policy in enhancing agricultural and rural development.

Although an in-depth study in different parts of the country is necessary for generalization, the result supports land policy that allows formal land transaction, which, in turn, results in the efficient use of land.
References


THE IMPACT OF LAND USE RIGHT AND ACCESS TO MARKETS ON LAND USES AND RURAL HOUSEHOLDS’ INCOME IN NORTHEAST ETHIOPIA¹

Getaw Tadesse*

Abstract

The paper investigates the long-term impact of user right privatization and access to wood markets on land uses, factor productivity and rural households’ income. The impact has been assessed using stationary equilibrium linear programming model, which assumes steady state harvesting of forest resources under alternative market conditions. The models were also used to compare the relative importance of tenure security and market access to tree products, such as firewood and timber. We used household data collected in 2002 from North Welo administrative zone where communal hillside lands were distributed for private use, to be used either as woodlots or pastureland. The result showed that in the long run, land use right privatisation (tenure security) is a necessary, but not sufficient, condition for environmental rehabilitation and improvement of farm households’ income. Good market access (better effective price) is by far more important. It has a win-win impact on the rural economy and the environment. Currently, farmers’ market participation is so limited. With the current market situation, only 25% of the degraded lands will be put under trees. When wood markets are relaxed, the adoption of woodlots as land use option increases to 46% and the average annual income increases by about five folds. However, in the short term, both tenure security and market access have insignificant impact due to high level of poor farm households’ time preference (discount rate). The average rate of time preference for sample households was about 70%. Economic incentives that internalize tree-planting externalities, improvement of wood markets and poverty reduction strategies that lessen the rate of time preference are some of the likely policy recommendations resulting from the study.

Key words: land use right, market access, hillside, degraded lands, tree-planting, and farm households’ income.

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1. INTRODUCTION

One of the major challenges facing Ethiopia in its strive for development is environmental degradation that has manifested in the form of land and water resources degradation as well as loss of biodiversity (Teketay 2001). According to Ethiopian Highland Reclamation studies, out of the 52 million hectares of land making up the highlands of Ethiopia, 14 million hectares are severely degraded, 13 million hectares are moderately degraded and 2 million hectares have particularly lost the minimum soil cover needed to produce plant (FAO 1984 in Lemma and G/hiywot 1999). The problem is more severe in Northeast Ethiopia where the topography is very undulated and large mass of the area became degraded. Degraded areas that lost both chemical and physical structures include hillside forest and rangelands, farmlands, riverbanks and large gullies. These lands are normally marginal and very steep hill slopes that cannot be used for cultivation. They were owned and managed as enclosure of common land and unregulated communal lands.

The extent of degradation of hillside lands varies across agro ecologies and districts. In Habru district, hillside lands are highly degraded with the exception of some protected areas by non-governmental organizations. Even though written evidences are scanty, elder people told us that before the 1970s these areas were covered with densely populated acacia species and were habitat of many endemic wild animals. The local communities were using them for ranges and woodlands with unregulated and unclear property rights. As time went on, trees were cut down, the rangelands were overgrazed, ecologically less important bushes were encroached and, in general, they remained without vegetation cover. Currently, these lands have started to rehabilitate after several years of enclosure. But still most of them are very eroded, with few scattered trees and bushes. Since they are boundaries between the highland mountains and the low land plain areas, their degradation has caused tremendous off-site effect on downhill farmlands. Large gullies, enlarged riverbanks and hills are some of the outcomes vividly seen between and within farmlands. In some places, there exist some irreversible damages.

To rectify the problem, a variety of natural resource management policies and programmes have been launched since 1970s. Massive soil and water conservation programmes, land reforms, and reforestation programmes have been undertaken, yet
little has been achieved to reverse the damages caused due to inadequate planning, evaluation and implementation.

The Amhara National Regional State has issued communal hillside land use right policy as part of institutional reforms to ensure sustainable land uses. The policy aims at reallocating user rights for those lands that were traditionally owned and used by the public as open or enclosed areas. The ultimate objectives were to generate employment and food security for landless farmers, solve the ever-increasing demand for fuel and construction wood, enhance forestation and integrate forest and forage development through increasing tenure security—the right to claim benefits. According to this policy, farmers have got the right to use the land for longer periods, 50-90 years, and secured right for their investment. Inheritance is allowed. But the government can reclaim the land at any time, paying the necessary compensation. Land can be used for pasture, tree plantation and orchard. It is also possible to use the land for other purposes, but with the acknowledgement of the local administration. According to the policy, eligible users are landless individuals, group of individuals and community organizations who have the necessary capacity to develop the land. Farmland owners are also eligible, depending on the availability of hillside lands.

North Welo Administrative Zone has started to implement the policy in 1996. So far, about 13973.5 hectares have been distributed for 83092 farm households. The agricultural department encourages tree planting by providing through subsidized seedlings. Very preliminary observation (e.g. Adgo 1999) indicates that encouraging results are being achieved after the distribution of the lands and recommends for the expansion of the project to other regions. Yet, farmers prefer to keep the area for grazing than planting trees. The reasons for such land use decision could be physical, economical or institutional which this study tries to investigate in detail. On the other hand, farm households show increasing interest in planting eucalyptus trees in their farmlands. This may endanger future food production of the region. Hence, policy makers are prone to discourage it as much as possible.

Privatization of communal lands to individual farm households increases tenure security and avoids the problem of ‘tragedy of the commons’ (Hardin 1968). It is a widely celebrated argument that secured user/property right assignment leads to efficient and sustainable use of natural resources and increases land investment (Perman et al., 1999; Dejene 1999). Secure and long-term use rights on land induce
exertion of higher levels of labour and management efforts and higher levels of investment to protect or enhance land fertility (Feeder and Feeny 1993). Tenure security provides incentives to today's forgone benefits with the hope that individuals will maximize the present value for future gains. This implies that tenure security reduces private discount rate and strengthens the planning horizon of the poor to avail themselves of the benefits of investments and land management. As a result, long-term investment is most likely feasible.

Experience from Asia indicates that a 50-year lease of forestlands for private use not only declined the pace of deforestation but also initiated planting of trees and fruits and the regeneration of forests through protective activities (Otsuka and Place 2001). Empirical evidences from two villages in Central Ethiopia show close links between various factors of land tenure (insecurity, extraction of peasant resources, lack of legal bases for the newly emerging land use dynamics, etc.), and the conservation of land resources and the extent to which environmental degradation is exacerbated. These factors impose less pain on the richest than on the poorest peasant households, although constraints on tree planting and soil conservation are considerable in all circumstances (Degefa 2000). Tree planting was found to be economically and environmentally a viable strategy to improve farm households' food security in less favoured areas of Ethiopia (Jagger and Pender 2003; Holden et al., 1998). But it needs tenure security to protect resources and harvest tree products.

However, tenure security per se may not be a guarantee for the rehabilitation of degraded lands and increasing farm income. Socially optimal use of natural resources and higher income may also be affected by other factors. The major ones are time preference or discount rate, access to markets (price) and other externalities. Access to markets affects the optimal use of resources through price variation. The impact of price change, particularly on natural resources like tree products, is a controversial agenda throughout resource economics literature. On one hand, an increase in price of, say, tree products, gives farmers incentives to cut trees which leads to deforestation. On the other hand, higher price encourages planting of trees because, as price increases, the relative gross margin from tree enterprises will be higher. Which theory overweighs depends on the particular situation and the problem at hand. In areas where deforestation is no more an agenda, the latter effect may outweigh. But it needs empirical investigation.
Therefore, this study was designed to examine the relative effects of user right and market access on sustainable use of resources and farm households' welfare.

The specific objectives of the study were:

- to analyze the relative impact of hillside land privatization and wood market access on degraded land use; and
- to compare the effects of hillside land privatization and wood market access on farm households' income, pattern of food and energy consumption and factor productivity.

2. THE DATA

The study was conducted in Habru district of North Welo, which is 490 km from Addis Ababa towards the northeast. The district consists of three major agro ecologies, such as highland, intermediate and lowland. The study concentrated on the intermediate (1600-1800 meters above sea level) part of the district.

The data were collected from secondary and primary sources in 2002. Secondary information, such as prices of grains, inputs, tree products, was gathered from published and unpublished reports of the district agricultural office, the nearby agricultural research organization and several other NGO's. Primary sources include sample household interviews, key informant interviews and group discussions with the local communities. A total of 100 farm households were sampled using stratified sampling procedure for the interviews.

3. MODELLING LAND USE DECISION

Whole-farm programming models consist of several activities and constraints which were developed for a representative farm household who owns hillside lands. Households might have different objectives including maximization of net income, minimization of risk, food self-sufficiency, and maximization of leisure time. We used a non-separable household model that maximizes net cash income from different
production activities, subject to a variety of constraints. The model has been abstracted from the utility maximization problem of farm households. Mathematically expressed as,

\[ \text{Max} = Z = \sum_{i=1}^{n} c_i X_i \]  

(1)

\[ \text{S.t. } \sum a_{ij} X_{ij} \leq b_j \]  

(2)

Where \( c_i \) = gross income or cost per unit of activity, \( X \) = Production or buying or selling activity, \( a_{ij} \) = per unit resource supply or demand of \( i^{th} \) activity from \( j^{th} \) constraint, \( b_j \) = maximum or minimum limits of \( j \) constraint and \( X_{ij} \geq 0 \) for all \( i \).

In order to overcome some of the criticism of linear programming, such as linearity and single objective, we included objective constraints and piece-wise activities. Market imperfections are captured through binding subsistence requirements (food, fuel), missing markets (e.g. manure, credit, and oxen rental), price bands for grains and limited markets (credit, off-farm employment, and wood demand).

Activities and constraints could vary for different scenarios. The major activities included into the model were tree planting, both on farm and hillside lands, crop production with alternative soil fertility management practices, livestock production, grazing land management, off-farm employment, consumption, selling and purchasing of products and inputs. The constraints were designed to capture both physical and behavioural determinants of farm household’s decision. Land, labour, cash, market and consumption preferences were put as constraints.

Since tree planting is an investment that needs more than one year to reap up benefits, the analytical model has been constructed to account for such inter-temporal decision. Hazel and Norton (1986) recommend two possible approaches of modelling investments, such as stationary equilibrium approach and multi-period linear programming. We found the former more appropriate to model the long-term plan of land uses. Stationary equilibrium linear programming model (SELP) focuses
on the optimal level of investments that should be attained in a steady state
harvesting of resources, i.e., resources uses assumed to be similar over years.

Planting and harvesting of *eucalyptus globules* and *acacia seyeal*, both on farm and
hillside lands, are included into the model mainly for wood production, either for sale
or home consumption. According to SELP, a replacement stock has to be developed
every year to sustain yearly harvesting, i.e.,

\[
S_1 = S_2 = \ldots \ldots S_T = H
\]

\[
\sum_{i=1}^{T} S_i = HL_i
\]

Where \(S_i\) = stock at different age, \(H\) = harvesting rate, \(T\) = rotation age, \(1/T\)
is replacement rate, \(HL_i\) = total area allotted for tree species \(i\). Equations (3) and (4)
were added to the LP as additional constraints.

The rotation age is determined outside the model using optimal harvesting technique
supplemented with actual farmers' practices. An optimal rotation age of 5, 7, 8, and
10 years were identified for eucalyptus on farmland, acacia on farmland, eucalyptus
on hillside land, and acacia on hillside lands, respectively, which corresponds to a
replacement rate of 20%, 14%, 12.5%, 10%, respectively.

Although the steady-state equilibrium model does not give clue on the time path of
implementing the resulting optimal plan, it lends itself to examining the long-term
effects on resource use behaviour of smallholders (Shiferaw and Holden 1999). A
long-term linear programming model was calibrated to three scenarios or plans.

- Plan-0 reflects the current observed activities of an average sample
  household.
- Plan-I simulates farm household decisions without hillside lands and with
  wood market constraint.
Getaw Tadesse

- Plan-II represents the long-term plan with hillside land uses but with restricted wood market. Wood (both firewood and timber) market demand is too small to absorb the available and expected wood production in the future. Every household may not have equal access to this limited wood market. So wood sales are restricted to the maximum of sample households' sales in 2001.
- Plan-III simulates farm household land use decision with hillside land and without wood market constraint.

4. RESULTS AND DISCUSSION

4.1. Impact on Land Use

The current land use situation indicates that more than 93% of the degraded hills are used for grazing. Except in few places, most farmers use open grazing that may lead to further degradation. However, there are few farmers who were able to demonstrate the potential applicability of cut and carry systems. Farmlands are mainly used for sorghum and teff. None of the respondents used fertilizer. The use of farmyard manure was also not significant. Manure was applied in only 14% of the farmlands during the study period.

The comparison between "with and without privatization" reveals that in the long run degraded hillside lands will possibly be used for woodlots (Table 1), which suggests the importance of privatization for sustainable land uses. Synchronized harvesting and planting of trees increases the expected profitability of woodlots in the long term, contrary to the reality of only planting in the short term. This result supports the hypothesis that privatization of communal lands by individual farm households increases tenure security and avoids the problem of 'tragedy of the commons'. However, the extent of tree planting on privately used hillside lands heavily depends on market conditions.

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2 Theoretically, if demand is low price, must go down to equilibrate with supply but this happens only for price elastic goods. Due to the fact that energy (woods are mainly used for energy) is a necessity good, wood market demand may not be price elastic. So, wood producers could not attract more demand through price change. Product development (timber woods) could be the possible way of relaxing the market demand.
With imperfect market situation (Plan-II), only 25% of the degraded lands will be put under trees. This is in excess of 18% compared to the current situation. Eucalyptus planting on farmlands will totally disappear due to low profitability of tree planting on farmlands. The effect of private use right on cropping pattern is not very much significant. Only sorghum area has increased by 17%. Others were kept constant, owing to farm level constraints, such as rotation requirement and consumption diversifications. The model is non-responsive for changes in land use right to chemical fertilizer application, too. But the use of manure for soil fertility maintenance has increased by about 21% (Table 1). This is because the production of manure has increased as a result of utilizing the hillside lands for grazing livestock.

<table>
<thead>
<tr>
<th>Land uses in ha</th>
<th>Current</th>
<th>Without Hillside Land</th>
<th>With hillside land and Imperfect Market</th>
<th>With hillside land and market access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside Land</td>
<td>0.28</td>
<td>0</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>Eucalyptus wood lot</td>
<td>0.02</td>
<td>0</td>
<td>0.07</td>
<td>0.13</td>
</tr>
<tr>
<td>Acacia wood lot</td>
<td>0.001</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Grass lands</td>
<td>0.26</td>
<td>0</td>
<td>0.21</td>
<td>0.15</td>
</tr>
<tr>
<td>Farmland</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Acacia wood lot</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Eucalyptus wood lot</td>
<td>0.02</td>
<td>0.05</td>
<td>0</td>
<td>0.16</td>
</tr>
<tr>
<td>Teff</td>
<td>0.42</td>
<td>0.39</td>
<td>0.38</td>
<td>0.17</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.45</td>
<td>0.3</td>
<td>0.36</td>
<td>0.42</td>
</tr>
<tr>
<td>Chickpea</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Finger millet</td>
<td>0.03</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
</tr>
<tr>
<td>Fertilized area</td>
<td>0</td>
<td>0.08</td>
<td>0</td>
<td>0.59</td>
</tr>
<tr>
<td>Manure area</td>
<td>0.16</td>
<td>0.61</td>
<td>0.74</td>
<td>0</td>
</tr>
</tbody>
</table>


When wood markets are relaxed (Plan-III.), the adoption of woodlots as a land use option increases to 46% and 14% on degraded hillside lands and farm lands respectively. Better access to wood market improves the relative profitability of tree planting investments through increased internal price of wood products. Relaxing markets with private hillside lands also change farmland use and management.
Moreover, teff cropping declines and fertilizer use increases. Unfortunately, the use of manure decreases to zero due to decline in livestock population. As wood products turn out to be more attractive, farm households become less interested to keep animals, except oxen, to which there is no rental market. The short-term fear of increased livestock, which may cause overgrazing and browsing on farmland plantings, will no longer be a problem. Under this situation (long term and adequate wood market demand), land use privatization is enough to affect farmers' decision towards social optimal use of resources.

The models are highly sensitive to farm size, carrying capacity of grasslands and productivity of woodlands. A rise in farm size reduces the possibility of using hillside lands for woodlot, while a rise in productivity of grassland and woodland increases tree planting on degraded lands. This suggests that, in addition to market expansion, technical improvement in productivity of hillside lands is quite important to affect the long-term land use decisions of farm households. But plans are still less sensitive to wood product market price reduction or increment. The back-up price due to inaccessibility and lack of effective demand for wood products is more important than market price. This shows how market imperfections are pervasive in rural areas.

4.2. Impact on Farm Households' Income

The same models explained above have been used to simulate the impact of land use right and wood market constraint on households' income and consumption pattern. The results indicate that hillside land use privatization, which gives access to the scarcest resource, causes significant effect on farm households' welfare in the long run. When hillside land was included in the model (Plan-II), the annual cash income of a typical farm household increased by about 72% (Table 2). This is due to cash income accrued from livestock, whose share increased from 36% to 56%, followed by crop production.

The impact is much more prominent if adequate wood market access is created (Plan-III). It has increased the annual cash income by about five folds. This is because of increased farm gate price of wood as a result of market access. But cash income sources have been changed from off-farm and livestock to tree products, implying decline in livestock population. This is good news for the environment, which has been highly threatened by overstocking. Wood sale, and not livestock, had been
the only source of cash income. It will serve as insurance for any event of crop failure. In dry areas, where drought is acute, relying more on perennial income source seems an additional merit of hillside land use privatization.

Table 2. Impact of Privatisation and Market Access on Farmers Income and Consumption

<table>
<thead>
<tr>
<th>Income/consumption</th>
<th>Plan-I</th>
<th>Plan-II</th>
<th>Plan-III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total net cash income in Birr</td>
<td>587</td>
<td>1010</td>
<td>5439</td>
</tr>
<tr>
<td>Net cash income from livestock</td>
<td>210</td>
<td>560</td>
<td>0</td>
</tr>
<tr>
<td>Net cash income from trees</td>
<td>725</td>
<td>725</td>
<td>6075</td>
</tr>
<tr>
<td>Net cash income from crops</td>
<td>-148</td>
<td>-88</td>
<td>-148</td>
</tr>
<tr>
<td>Net cash income from employment</td>
<td>119</td>
<td>119</td>
<td>0</td>
</tr>
<tr>
<td>Food production in tone</td>
<td>0.76</td>
<td>0.79</td>
<td>0.76</td>
</tr>
<tr>
<td>Teff consumption in tone</td>
<td>0.17</td>
<td>0.12</td>
<td>0.07</td>
</tr>
<tr>
<td>Sorghum consumption in tone</td>
<td>0.2</td>
<td>0.25</td>
<td>0.3</td>
</tr>
<tr>
<td>Finger millet consumption in tone</td>
<td>0.37</td>
<td>0.37</td>
<td>0.37</td>
</tr>
<tr>
<td>Fuel wood consumption in tone</td>
<td>2.1</td>
<td>1.7</td>
<td>0.06</td>
</tr>
<tr>
<td>Crop residue consumption for fuel in tone</td>
<td>0.2</td>
<td>0</td>
<td>0.9</td>
</tr>
<tr>
<td>Animal dung consumption for fuel in tone</td>
<td>0</td>
<td>0.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>


4.3. Impact on Food and Energy Consumption Pattern

Private land use right has little effect on food production and grain consumption pattern (Table2). Without hillside land (Plan-I) farmers produce about 86% of their food requirement and this has slightly increased to 90% with access to hillside land (Plan-III). The effect totally disappeared when the control on wood market was relaxed. However, the consumption of teff declines as a response to decline in teff production. The effect is more apparent when wood market absorbs all wood supplies (Plan-III). Its share becomes only 8% of the total grain consumption as opposed to 19% in the base plan. This is because the production of teff for income generation will no more be attractive, as tree products become important sources of cash.

As response to private land use right, farm households’ energy consumption has shifted from fuel wood to animal dung. Without adequate wood market access, fuel wood energy share declined from 91% to 74%. The use of animal dung as fuel
source has now increased from the previous zero level to about 17% of a household's total energy consumption. This is due to increased manure production, following improved access to grazing land, which, in turn, resulted in increase of animal population. An increase in animal dung reduces the internal price of it and households prefer animal dung as energy source to wood. Thus, wood consumption has shown a decline.

Wood market expansion has also altered energy consumption from fuel wood to crop residue and animal dung. Farm households use wood as energy source only when there is limited supply of manure and limited access to wood market. As wood market expands, home consumption of fuel wood has declined by about 96%, while animal dung consumption has increased regressively (Plan-III). Wood market expansion increases the internal price of wood that causes decline in consumption. At the same time, it increases the internal price of animal dung due to reduction in livestock population. Since the relative price between fuel wood and animal dung is positive, even if the price of animal dung increases, its consumption keeps on increasing. The expected profit effect of price change on consumption is not strong to off-set substitution and income effects in this study.

4.4. Impact on Factory Productivity

The impact of privatisation of degraded land on factor productivity has been assessed for the base plan (Plan-I), wood market constrained (Plan-II) and unconstrained (Plan-III) scenarios. Factor productivity was measured based on shadow prices, or marginal value products, at the optimal solution. The result from Plan-II revealed that land use privatisation has caused a decline in marginal productivity of farmlands, animal feeds and manure and an improvement in marginal productivity of cash for livestock investment (Table 3). The law of diminishing marginal productivity dictates the decline in marginal productivity of such inputs. Access to private hillside lands relaxes farmland constraints and increases animal feed and manure availability that triggers down their marginal values. But it has no effect on productivity of labour because of low rate of tree planting that would have created employment opportunities.

When farm households get full access to wood markets, the marginal values of land, labour, cash and manure will certainly increase (Plan-III). The marginal values of an
additional farmland and hillside land have showed one fold increment as compared to Plan-II. Labour productivity increases from 0 to 14 Birr per day, which is a 133% increase of the current market wage rates. The shadow price of cash for variable inputs has also been aggressively boomed up by about 300%. Wood market access enhances tree planting that demands more land, labour and cash. Thus, labour and cash become binding constraints.

Table 3. Impact of Privatisation and Market Access on Factor Productivity (MVP in Birr)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Plan-I</th>
<th>Plan-II</th>
<th>Plan-III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillside land</td>
<td>5701</td>
<td>1060</td>
<td>2201</td>
</tr>
<tr>
<td>Farm land</td>
<td>5701</td>
<td>1060</td>
<td>2201</td>
</tr>
<tr>
<td>Labour</td>
<td>0</td>
<td>0</td>
<td>13.9</td>
</tr>
<tr>
<td>Ox days</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cash for animals</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cash for variable inputs</td>
<td>1.7</td>
<td>0.86</td>
<td>3.3</td>
</tr>
<tr>
<td>Animal feeds</td>
<td>890</td>
<td>410</td>
<td>974</td>
</tr>
<tr>
<td>Teff straw</td>
<td>1462</td>
<td>547</td>
<td>1449</td>
</tr>
<tr>
<td>Sorghum stalk</td>
<td>51</td>
<td>150</td>
<td>207</td>
</tr>
<tr>
<td>Grass</td>
<td>588</td>
<td>1547</td>
<td></td>
</tr>
<tr>
<td>Manure</td>
<td>92</td>
<td>21</td>
<td>330</td>
</tr>
<tr>
<td>Fertilizer-DAP</td>
<td>2.5</td>
<td>0.005</td>
<td>2.5</td>
</tr>
<tr>
<td>Fertilizer-Urea</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Seedlings</td>
<td>0.27</td>
<td>0.48</td>
<td>0.18</td>
</tr>
</tbody>
</table>


6. CONCLUSION AND POLICY IMPLICATIONS

Three major conclusions are vividly seen out of this study. First, private use of degraded lands is a necessary, but not a sufficient condition, for rehabilitation of the environment as well as improving farmers' income. Second, market access that creates effective demand for tree products is essential for private tree planting in the long run. Third, improving markets has a win-win impact on the environment and income of the rural households. But the short-term decision is non-responsive either to land use right or market improvement. Therefore, a number of polices and strategies can be recommended to support the current environmental rehabilitation and poverty reduction endeavours.
Expansion of wood markets is so imperative to boost private tree planting. Substitution of eucalyptus tree with high value timber trees may relax the existing wood demand problem. Development of market infrastructures, such as roads, information access and establishment of saw mill plants can also encourage tree planting on degraded lands. The current privatization program provides the necessary incentives to regulate the degraded lands from intrusion. Thus, it needs to be further expanded.

Today’s investment by farmers will fetch benefits in the long run. This may discourage today’s environmental protection efforts to a certain extent as farmers usually opt for quick results. Hence, short-term economic support is highly desirable to encourage tree planting. The economic support is socially justifiable because the society at large gains from the positive externality generated through private tree planting. Governmental and non-governmental organizations may need to launch food-for-tree planting, subsidized seedling, or any cash incentives in order to boost sustainability and income generation.
The Impact of Land Use Right and Access to Markets on Land Uses and ...

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COUNTING ON FORESTS: NON-TIMBER FOREST PRODUCTS AND THEIR ROLE IN THE HOUSEHOLDS AND NATIONAL ECONOMY IN ETHIOPIA.

Mohammed Adilo*, Tadesse Woldemariam* and Abebe Yadessa* 

Abstract

Income from non-timber forest products (NTFPs) represents a considerable share of the total income portfolio of the rural poor and thus to the national accounts of Ethiopia. However, the contribution of income from NTFPs has largely been overlooked in the mainstream macro economy. This paper reviews the contribution of NTFPs to the household income and foreign currency income from exports. The paper focuses on the major NTFPs such as forest coffee, honey, gums and resins, spices, game hunting and indirect services, like eco-tourism. The future prospects of these NTFPs are also discussed. Recognition of NTFPs in national accounting systems is important for forest resources related policy reform. Recommendations for sustainable forest management and NTFPs production/ development are also forwarded.

Keywords: Coffee, commercialisation, ecotourism, gums and resins, honey, and spices.

1. INTRODUCTION

The use of forests and forest products is as old as the human history itself. Man started managing forests to increase natural stands of edible plants like taro, bananas and yam (Wiersum 1997). Still today, there is an increased recognition of the role of
non-timber forest products (NTFPs) across the globe. NTFPs play a pivotal role in providing important community needs for improved rural livelihood, contribute to household food security and nutrition, help to generate additional employment and income, offer opportunities for NTFP-based enterprises, contribute to foreign exchange earnings, and support biodiversity and other conservation objectives (FAO 1995b; de Beer and McDermott 1989; Ros-Tonen et al., 1995). Sale (1981) has also provided a substantial list of potential consumption, production input and asset formation obtained from forest resources in Africa. The small-scale production and trading activities in forest products constitute one of the largest parts of rural non-farm enterprise employment (Liedholm and Mead 1993).

A forest product-based activity usually constitutes part of traditional agricultural practices. For many Ethiopians, the money earned from collecting, selling or processing forest products provides an indispensable contribution to household income. Income from NTFPs enables rural households to purchase consumable goods and pay for basic expenses. The importance of forest income usually lies more in its timing rather than its magnitude (Arnold and Townson 1998). Pol (2001, 2002) has pointed out the potential of non-timber forest products for food security and rural livelihood in Ethiopia. However, the actual contribution of NTFPs to specific rural households and national economy is also worth mentioning. The most important NTFPs that generate substantial income to rural households and foreign currencies to the country are coffee, honey, natural gums and resins. However, information on the production, trade and demand for products produced at household, small enterprise and national levels are scanty. This paper presents a review of available information on NTFPs-based income. Emphasis is given to forest coffee, honey, gums and resins, spices, and ecotourism.

## 2. FOREST COFFEE

Coffee *arabica*, which originated from the Ethiopian montane rain forest, is a highly valued commodity worldwide. In addition to coffee, other products are also harvested

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1 NTFPs are defined in this case as those products of biological origin (e.g., fruit tree, coffee, gum and resin, medicinal tree, bamboo, spices), other than processed timber for construction or industrial purposes, that are harvested from forest ecosystem either for home consumption or sold in the market.
from forest coffee. It is common among rural households to extract useful products, like firewood, construction materials, fence posts, and fruits from the forest, apart from the coffee harvested each year. Such diversification of income protects small producers from shocks arising from the vagaries of nature, international market fluctuations, or societal structures. With coffee as the under-storey shrub, a mixed shade cover of fruit trees, banana plants, and towering timber species form forest-like agro ecosystem. Such a system results in a fairly stable production pattern, favourable climatic conditions, and replenished soil with organic matter via leaf litter production, and environmentally benign and ecologically stable agro ecosystem.

2.1. Role in Local and National Economy

Ethiopia’s economy is heavily dependent on agriculture. Agriculture accounts for half of GDP, 90% of exports and 80% of total employment. According to Tafesse (1996), coffee contributed to 4-5% of GDP, 20% of government revenue, 60% of total foreign exchange earnings and a livelihood for more than 25% of its population. Ethiopia earned US $267 millions in 1999 by exporting 105,000 metric tons of coffee. CIA (2002) also reported that coffee contributes to 10 % of Ethiopia’s GDP and generates 60% of export earnings. Coffee production provides employment in rural areas and is the means of livelihood for over 15 million people in Ethiopia. Being an important export commodity, coffee plays a vital role in both cultural and socio-economic life of the country.

<table>
<thead>
<tr>
<th>Coffee</th>
<th>Volume ('000 tones)</th>
<th>Price/Kg</th>
<th>Total Revenue (USD million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000/01</td>
<td>95.6</td>
<td>1.9</td>
<td>182.0</td>
</tr>
<tr>
<td>2001/02</td>
<td>110.3</td>
<td>1.48</td>
<td>163.3</td>
</tr>
<tr>
<td>2002/03</td>
<td>126.1</td>
<td>1.31</td>
<td>165.3</td>
</tr>
<tr>
<td>Total</td>
<td>332.0</td>
<td></td>
<td>510.6</td>
</tr>
</tbody>
</table>


Forest coffee accounts for about 4-5 per cent and semi-forest coffee for about 20 per cent of Ethiopia’s total coffee production. Garden coffee is grown in the vicinity of a farmer’s residence. Garden coffee is mainly grown in the southern and eastern parts of the country. Currently, garden coffee accounts for about 70 per cent of Ethiopia’s total coffee production but this is expected to increase with the introduction of the
practice into southwest Ethiopia. Plantation coffee is found in state farms and in some well-managed smallholder coffee farms. Well managed, smallholder coffee farms account for about 5-6 per cent of Ethiopia’s total production.

2.2. Future Prospects

Even though Ethiopia is the origin of coffee, it has never been a strong competitor in the coffee industry due to its dependency on traditional means of production, like forest, semi-forest and garden coffee production systems. Today, large-scale coffee plantations are not as economical as they used to be since over production of coffee has pervaded the world market. There is, however, a growing niche market (specialty coffee) for traditional and subsistence production systems like that of Ethiopia. The traditional production systems in Ethiopia, especially in the southwest, maintain high biological and genetic diversity of the coffee plant, which is free of external inputs. Hence, the coffee produced in these areas can be marketed as any of the specialty coffees, such as organic, wild, fair-trade, bird-friendly and shade grown coffee. Ethiopia has no competitor in the wild coffee market. The Forest Stewardship Council (FSC) has shown interest to certify Ethiopian forest products, mainly forest coffee, spices and honey, if the criteria for certification can be met (Personal communication, Demel Teketay, FSC Africa Regional Director 2004). This will contribute to the commercialisation of NTFPs.

The recent discovery of the caffeine-free coffee plants from Ethiopia (Silvarolla et al., 2004) adds a new dimension to the Ethiopian coffee production and commercialisation, since there is a growing demand for such coffee, currently standing at about 10%. Decaffeinating coffee on an industry level is expensive, and there is little success to develop caffeine free coffee through inter-species cross breeding with other caffeine-free species. The presence of naturally decaffeinated coffee population will contribute to the success of breeding caffeine-free coffee, which will boost the economy of the country.

The foreign exchange earned from coffee and the number of people it has employed make coffee a commodity of paramount importance to the country. Coffee will continue to be the most important source of income and export commodity in the future, too. However, macroeconomic policies, such as settlement in forest areas, allocation of forestlands for investors and conversion of forests to other land use
systems are in one way or another diminishing the montane forests ecosystem, where organic coffee and other non-timber forest products are found. Unless development efforts encourage the conservation and sustainable utilization of the forest coffee ecosystem, the future of montane forests, in general, and organic coffee, in particular, will be gloomy and the consequence will be irreversible.

3. **THE GUM AND RESINS**

Exudates of the gum type, i.e., water-soluble carbohydrates, are obtained from a considerable number of trees and shrubs, partly by active tapping and partly by simple collection of gum that occasionally "oozes" from *Acacia, Commiphora, Boswellia* and other trees and shrubs. Since time immemorial, the aroma of incense smoke constitutes a striking feature of religious rituals in many countries.

3.1. **Role in Local and National Economy**

Tapping of frankincense and myrrh provides not only considerable cash income and employment opportunity (Tilahun 1997; Mulugeta 2003), but also fetches valuable foreign currency.

In only Liban zone of the ESNRS, collection and sale of oleo-gum resins fetches annually an average of US$80.00 income per household (Mulugeta et al., 2003), an income that covers one-third of the annual subsistence budget of a pastoral household. This contribution from oleo-gum resins was three fold greater than the contribution from arable crop in the area (Mulugeta et al., 2003, 2004). Similarly, a study made in Tigray revealed that tapping of frankincense provides considerable employment opportunity for the local people. For instance, about 7000 seasonal labourers are employed annually, of which one third are women. At national level, the number of seasonal workers engaged in tapping and grading is estimated in the range of 20,000 - 30,000 per year. Men are mainly involved in tapping and collecting incense from the forest while women undertake sorting and grading. A taper can collect about 10-15 quintals of incense per annum and receives a net income US$100 to 150 (Aregawi 1997) in Tigray. Women earn an average income of US$16 per month (Tilahun 1997). Table 3 below shows the number of seasonal workers
Mohammed Adilo, Tadesse Woldemariam, and Abebe Yadessa

employed in tapping, collecting and processing in Tigray Regional State during the period 1996-1999.

Table 2. Actual Natural Gum Production/export by Type for Year 1992-1999 in Ethiopia

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tigray/Eritrian type olibanum</td>
<td>18004</td>
<td>25266</td>
<td>30637</td>
<td>NP</td>
<td>NP</td>
<td>11923</td>
<td>7178</td>
<td>14223</td>
</tr>
<tr>
<td>Ogaden type olibanum</td>
<td>317</td>
<td>596</td>
<td>343</td>
<td>478</td>
<td>2627</td>
<td>58</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Borana type olibanum</td>
<td>54</td>
<td>251</td>
<td>1168</td>
<td>2005</td>
<td>1777</td>
<td>106</td>
<td>NP</td>
<td>NP</td>
</tr>
<tr>
<td>Myrrh</td>
<td>373</td>
<td>291</td>
<td>958</td>
<td>486</td>
<td>743</td>
<td>1051</td>
<td>853</td>
<td>NP</td>
</tr>
<tr>
<td>Oppoponax</td>
<td>135</td>
<td>33</td>
<td>NP</td>
<td>9</td>
<td>53</td>
<td>147</td>
<td>80</td>
<td>122</td>
</tr>
<tr>
<td>Gum acacia</td>
<td>92</td>
<td>269</td>
<td>1098</td>
<td>1485</td>
<td>1130</td>
<td>56</td>
<td>582</td>
<td>36</td>
</tr>
<tr>
<td>Total</td>
<td>18975</td>
<td>26706</td>
<td>34214</td>
<td>4483</td>
<td>6330</td>
<td>13341</td>
<td>8693</td>
<td>15378</td>
</tr>
</tbody>
</table>

Source: Girmay Fitwi (2000); NP = no production.

Table 3. Manpower Deployed by the Ethiopian Gum Processing and Marketing Enterprise

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Collectors</td>
<td>800</td>
<td>1700</td>
<td>1131</td>
<td>1634</td>
</tr>
<tr>
<td>Sorters</td>
<td>1000</td>
<td>1150</td>
<td>693</td>
<td>915</td>
</tr>
<tr>
<td>Permanent employees</td>
<td>227</td>
<td>221</td>
<td>204</td>
<td>199</td>
</tr>
<tr>
<td>Contract workers</td>
<td>36</td>
<td>52</td>
<td>46</td>
<td>51</td>
</tr>
</tbody>
</table>

Source: Kindeya et al., 2002.

Ethiopia is one of the major producers and exporters of natural gum and gum resins. Oleo-gum resins, such as frankincense, have been items of great historical commerce in the Horn of Africa, in general, and in Ethiopia, in particular, (Ahmed 1982; Coutler 1987; EFAP 1994; Girmay Fitwi 2000; Abeje 2002; Mulugeta and Demel 2003). Today they are among the top export items from Ethiopia, accounting for about one-half of one percent of the total export value. Between 1996-1999, about 1466 tones of frankincense, 1925 tones of myrrh and 1649 tones of gum arabic were exported from Ethiopia valued at USD 2.5, 2.6 and 2.1 million, respectively (Table 4).
Table 4. Natural Gum Exports of Ethiopia Through Official Routes

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantity (Tones)</th>
<th>Value (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992/93</td>
<td>147</td>
<td>451000</td>
</tr>
<tr>
<td>1993/94</td>
<td>498</td>
<td>1188000</td>
</tr>
<tr>
<td>1994/95</td>
<td>1887</td>
<td>2010000</td>
</tr>
<tr>
<td>1995/96</td>
<td>1431</td>
<td>1519000</td>
</tr>
<tr>
<td>1996/97</td>
<td>1466</td>
<td>2489000</td>
</tr>
<tr>
<td>1997/98</td>
<td>1925</td>
<td>2603000</td>
</tr>
<tr>
<td>1998/99</td>
<td>1649</td>
<td>2092000</td>
</tr>
</tbody>
</table>


Demand for frankincense and myrrh is high in the domestic market for fumigation and religious rituals. According to Tilahun (1997), the present supply satisfies less than 15% of domestic demand. Between 1979 and 2001 domestic sale is higher than foreign sale, indicating a considerable amount is consumed in the country (Table 5). Furthermore, Table 5 provides the volume of sales in both domestic and export markets by Guna Trading House; NGPME; Sihul Project Company from 1979 to 1991 and NGPME from 1992-2001.

The average production of gums and resins as a whole is 148,780.46 tones, valued at 14.3 million Birr (equivalent to about USD 1.64 million) Table 5. This excludes the unrecorded domestic trade and illegal exports to neighbouring countries, like Somalia, Kenya and Sudan.

In general, taking the worldwide demand for natural gums and incense on one hand, and the potential of the resource we have on the other, Ethiopia will be more benefited from the export of these items provided efforts are made to develop these resources more than the current situation. Some of the development strategies include: implementation of the draft forestry policy, incorporation of available knowledge on the production and management of gums and resins into the extension package, and domestication of gums and resins yielding species.
Table 5. Volume of Sales in Both Domestic and Export Markets from 1979 to 2001

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic sale</th>
<th>Foreign sale</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount (Tones))</td>
<td>Value (Birr in '000)</td>
<td>Amount (tones)</td>
</tr>
<tr>
<td>1979</td>
<td>270.10</td>
<td>607.33</td>
<td>82.20</td>
</tr>
<tr>
<td>1980</td>
<td>599.00</td>
<td>2179.51</td>
<td>208.20</td>
</tr>
<tr>
<td>1981</td>
<td>810.30</td>
<td>2205.33</td>
<td>1043.00</td>
</tr>
<tr>
<td>1982</td>
<td>828.10</td>
<td>2116.62</td>
<td>836.20</td>
</tr>
<tr>
<td>1983</td>
<td>713.20</td>
<td>2540.45</td>
<td>1904.20</td>
</tr>
<tr>
<td>1984</td>
<td>913.00</td>
<td>3944.21</td>
<td>998.50</td>
</tr>
<tr>
<td>1985</td>
<td>1397.50</td>
<td>4343.40</td>
<td>770.00</td>
</tr>
<tr>
<td>1986</td>
<td>1084.40</td>
<td>4660.90</td>
<td>663.40</td>
</tr>
<tr>
<td>1987</td>
<td>923.90</td>
<td>3908.00</td>
<td>117.00</td>
</tr>
<tr>
<td>1988</td>
<td>1103.00</td>
<td>5551.40</td>
<td>117.00</td>
</tr>
<tr>
<td>1989</td>
<td>535.80</td>
<td>3279.00</td>
<td>133.00</td>
</tr>
<tr>
<td>1990</td>
<td>102.80</td>
<td>5480.00</td>
<td>117.00</td>
</tr>
<tr>
<td>1991</td>
<td>102.70</td>
<td>548.00</td>
<td>117.00</td>
</tr>
<tr>
<td>1992</td>
<td>556.30</td>
<td>3279.00</td>
<td>133.00</td>
</tr>
<tr>
<td>1993</td>
<td>1188.00</td>
<td>6843.00</td>
<td>394.90</td>
</tr>
<tr>
<td>1994</td>
<td>1281.26</td>
<td>5658.61</td>
<td>1321.47</td>
</tr>
<tr>
<td>1995</td>
<td>1727.71</td>
<td>7144.15</td>
<td>1043.26</td>
</tr>
<tr>
<td>1996</td>
<td>645.70</td>
<td>3296.50</td>
<td>429.49</td>
</tr>
<tr>
<td>1997</td>
<td>410.50</td>
<td>2009.88</td>
<td>1013.98</td>
</tr>
<tr>
<td>1998</td>
<td>760.356</td>
<td>2684.29</td>
<td>756.00</td>
</tr>
<tr>
<td>2000</td>
<td>619.569</td>
<td>1067.72</td>
<td>515.00</td>
</tr>
<tr>
<td>2001</td>
<td>644.368</td>
<td>1867.90</td>
<td>815.00</td>
</tr>
<tr>
<td>Total</td>
<td>18391.561</td>
<td>77853.09</td>
<td>15827.91</td>
</tr>
</tbody>
</table>


3.2. Future Prospects

As far as marketing prospects are concerned, while substitutes already exist for replacement of the acacia in certain domains of utilization, it seems quite likely that the chemical industry will develop alternative products, on a large scale, to replace this relatively costly raw material. However, it appears more uncertain whether
Counting on Forests: Non-timber Forest Products and Their Role in the Household...

synthetic materials will ever seriously threaten the market for frankincense or myrrh. The present worldwide trend, which favours utilization of healthy ‘ecological’ products, may lead to increased future demand for such natural products, like gum. Following this, if we make analysis of the annual income obtained at various levels, on one hand, and all indirect uses that we could obtain from direct conservation functions of the forest, including the conservation of life support systems, biodiversity resources, regulation of the local climate and the hydrological cycle, on the other, then we arrive at the present trend of utilizing this resource (by clearing and burning for non-productive cultivation) which is totally destructive, leading to total degradation and desertification. Moreover, frankincense and myrrh are known to have wider pharmacological and industrial uses and potential (Mulugeta and Demel 2003), which have not yet been exploited in Ethiopia. Such industrial operations have the potential of generating enormous employment opportunities for the local people and significant contribution to the national economy. Therefore, the formulation and implementation of appropriate policies is of paramount importance to use these resources on a sustainable basis, both locally and nationally.

4. HONEY/BEESWAX

Honey is a much-valued product from forested areas around the world. Trees often play an important role in honey production as they provide fodder for bees throughout the year. Forest honey constitutes an important non-timber forest product in many developing countries, both as a source of food (100g of honey supplies about 280 calories), tonic and medicine for local communities as well as a source of revenue for governments. The Ethiopian climate and the extended flowering season are favourable for apiculture. Beekeeping is widespread in most parts of Ethiopia, especially in the southwest montane forest region. Beekeeping is a highly conservational system as income is generated through the honeybee flora. Furthermore, the benefits received from beekeeping encourage the preservation of the forest.

4.1. Role in Local and National Economy

The basic economic pillars of the current land use system are the use of non-timber forest products for cash, especially beekeeping, for subsistence and enset-based
On average, households in southwest Ethiopia own 20-30 beehives (personal observation). Although the yields vary with the rainfall, in good years one hive can produce about 5-6 kg of honey, and a household can obtain about 100-200 kg per year. Price per kg is 8-10 Birr. Thus the potential annual income from honey can reach 800-2000 Birr. According to Pol (2001), Ethiopia’s annual honey production is 24,000 MT, equal to about one third of the total honey production in Africa, making Ethiopia the largest honey producing country in Africa and worldwide (FAOa 1995; Fichtl and Admasu 1994). Of the total domestic production, around 20% is used as table honey in rural areas, 55-60% is used in the production of tej (a local beverage) and only a small portion of the product is marketed. An average of 3.05 tones per annum has been exported to neighbouring countries over the years 1984-1994. On average, between 1998 and 2003, 307.22 tones of honey, worth 88,679 Birr have been exported yearly (Table 6), indicating a 300% increase compared to that of 1984-1994.

Table 6: Export of Nature Honey from 1998 – 2003 Through Official Route

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Honey (in tones)</th>
<th>Value in Birr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>178.1</td>
<td>78188</td>
</tr>
<tr>
<td>1999</td>
<td>100.8</td>
<td>29245</td>
</tr>
<tr>
<td>2000</td>
<td>761.2</td>
<td>221363</td>
</tr>
<tr>
<td>2001</td>
<td>129.0</td>
<td>30922</td>
</tr>
<tr>
<td>2002</td>
<td>333.9</td>
<td>93269</td>
</tr>
<tr>
<td>2003</td>
<td>340.3</td>
<td>79087</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1843.3</td>
<td>532074</td>
</tr>
<tr>
<td>Average</td>
<td>307.22</td>
<td>88,679</td>
</tr>
</tbody>
</table>

Source: Ethiopian Customs Authority.

Beezwax is a by-product of honey. Ethiopia is the fourth largest wax producing country in the world and one of the five biggest wax exporters to the world market (Fichtl and Admasu 1994). Ethiopian beeswax is mainly exported to Japan, Germany, Netherlands and the USA. An average of 270 tonnes, worth 2 million Birr, were exported per year over the period of 1984-1994. Currently, the annual turnover of the apicultural industry varies between 185 and 450 million Birr, of which only 5 million

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Birr worth of beeswax was exported. Almost the entire production is harvested using traditional beehives.

<table>
<thead>
<tr>
<th>Year</th>
<th>Wax (in tones)</th>
<th>Value (in Birr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>84183.9</td>
<td>10513987</td>
</tr>
<tr>
<td>1999</td>
<td>34969.3</td>
<td>9914049</td>
</tr>
<tr>
<td>2000</td>
<td>21692.4</td>
<td>5549274</td>
</tr>
<tr>
<td>2001</td>
<td>31095.1</td>
<td>7247268</td>
</tr>
<tr>
<td>2002</td>
<td>28498.3</td>
<td>6005768</td>
</tr>
<tr>
<td>2003</td>
<td>24426.7</td>
<td>4699735</td>
</tr>
<tr>
<td>TOTAL</td>
<td>224,865.7</td>
<td>4,393,0081</td>
</tr>
<tr>
<td>Average</td>
<td>37,477.61</td>
<td>7,321680.16</td>
</tr>
</tbody>
</table>

Source: Ethiopian Customs Authority.

4.2. Future prospects

Ethiopia is considered to be a potential giant for honey production in Africa due to its diverse habitat and flora. The forest areas in the southwestern and southeastern parts of the country are well known for their honey production. In these regions, traditional skills and forest resources for bee forage are available. The areas are free of pesticides and other agrochemical residues (Hartmann 2004). With improved management, there is a great potential for quality honey production and commercialisation in the country. To date, honey production and commercialisation is mainly based on traditional methods, using hives made from logs, barks and clays and hanged on trees to attract swarms of local bees. Production and commercialisation from traditional hives is low. The use of modern box hives has doubled production. Honey quality could also be improved through better transport and storage. Control of deforestation and associated landscape degradation, active planting of nectar-yielding plants and the development of processing and marketing schemes would be some of the basic means to increase the volume and value of honey and wax production. Furthermore, economically important honey products are propolis and pollen, and others that are used in pharmaceutical, cosmetic and colour industries. Being free from agro-chemical residues, forest honey has the potential of being marketed as 'organic honey'. Thus, integrating honey production and
commercialisation to forest management is vital to attract and enhance international trade.

5. SPICES

Ethiopia, especially the mountainous forest region in the southwest, has a great potential for spices production. *Korerima*, a potential substitute for the Indian cardamom, is endemic to the rain forest areas of the SW region. The species can easily be propagated from rhizomes and seeds. At present, micro propagation for mass production of seedlings from good quality plants is also being developed (Wondyifraw and Wannakrairoj 2004). Long pepper (*Piper capense*) can also be a substitute for black pepper. Its propagation is easily possible from seeds. It does not need support like other *Piper* species and has short stems for ease of management and harvesting. Unlike *Piper* species, it can also be densely planted in large quantity to produce high yield.

5.1. Role in Local and National Economy

Although accurate data are not available, the use of spices for local economy is considerable. Ethiopia used to export a considerable amount of *korerima* capsules to the world market, mainly as a substitute for the Indian cardamom (Jansen 1981). Table 8 shows the bulk of spices exported from 1998 – 2003 through official routes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Spices (in tones)</th>
<th>Value (in birr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>201715.6</td>
<td>12280280</td>
</tr>
<tr>
<td>1999</td>
<td>268787.9</td>
<td>23703861</td>
</tr>
<tr>
<td>2000</td>
<td>328496.6</td>
<td>28554827</td>
</tr>
<tr>
<td>2001</td>
<td>268206.5</td>
<td>27725182</td>
</tr>
<tr>
<td>2002</td>
<td>316835.0</td>
<td>31870026</td>
</tr>
<tr>
<td>2003</td>
<td>489902.6</td>
<td>44303002</td>
</tr>
<tr>
<td>Total</td>
<td>1,873,944.2</td>
<td>168,437,178</td>
</tr>
<tr>
<td>Average</td>
<td>313,324.03</td>
<td>28,072,863</td>
</tr>
</tbody>
</table>

*Source:* Ethiopian Customs Authority.
5.2. Future Prospects

*korerima* has some superior qualities compared to cardamom: it has a relatively wider adaptation and higher productivity (ca. 5.5 fold), a factor that could have attracted producers’ interest to expand its production (Wondyifraw and Wannakrairoj 2004). However, there are no visible activities regarding establishment of new plantations due to varied problems associated with the sector. Lack of sustainable market outlet and absence of processing industries are some of the bottlenecks; the same is also true for other spices. Therefore, considering the potential value of spices for local and national economy and the need for their commercialisation, urgent attention is needed to improve the production system.

6. ECOTOURISM

Forests have a wide range of recreational opportunities. They constitute crucial habitat for game animals and fish sought by hunters and anglers. A major part of non-consumptive recreational activities, such as hiking, bird watching, wildlife viewing and other such pursuits occur within forest stands. In recent decades, ecotourism has emerged as a popular type of nature-based tourism. The International Ecotourism Society (TIES) defines this activity as "responsible travel to natural areas that conserves the environment and sustains the well-being of local people". Essentially, it is a small-scale, ecologically sustainable tourism that takes place in natural areas; it encourages the environmental education of tourists, contributes to conservation while promoting the economic and social well being of local communities. As such, ecotourism is dependent on natural areas, particularly national parks and managed forests.

6.1. Role in Local and National Economy

Ecotourism is a booming business and constitutes a potentially valuable non-extractive use of tropical forests. It is a fast-growing sector of the world’s largest industry, tourism. According to development and conservation organizations, the potential of ecotourism to increase the economic attractiveness of conserving tropical rain forests should be promoted. It is argued that with this comparatively "judicious" use of forest resource, the following can be achieved:
1) Negative environmental impacts on the forest ecosystems can be kept low, 
2) New and/or additional funds can be mobilized to support protected forest 
areas, and 
3) The living conditions of the local population can be improved through the 
provision of alternative sources of income and employment.

This would lead to a greater interest by the parties concerned in maintaining and 
reserving protected tropical forests more effectively. Ecotourism has attracted the 
attention of protected area managers because ecotourists are fascinated by areas of 
high biodiversity and, with good tour interpretation, can come to appreciate the 
intricacies of any ecosystem. Currently, there are no European data on ecotourists 
but North American research indicates that ecotourists play a major role in 
conservation through payment of entrance fees to protected areas and are willing to 
pay more for the services they get from tour operators, who actively participate in 
conservation activities. It is known that some tour operators have even established 
non-profit organizations to help protect natural resources. Ecotourists boost local 
economies with longer stays and support local values when they select authentic 
experiences over commercialized products.

In Ethiopia, for instance, a substantial amount of income was obtained from trophy 
hunting in Hanto CHA (Table 9).

Table 9. Annual Income from Trophy Hunting at Hanto

<table>
<thead>
<tr>
<th>Year</th>
<th>Income (in USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>23230</td>
</tr>
<tr>
<td>2000</td>
<td>34930</td>
</tr>
<tr>
<td>2001</td>
<td>53980</td>
</tr>
<tr>
<td>2002</td>
<td>65920</td>
</tr>
<tr>
<td>2003</td>
<td>55930</td>
</tr>
<tr>
<td>Total</td>
<td>233,990</td>
</tr>
</tbody>
</table>


More than 50% of tourists visiting Ethiopia are lovers of nature, interested in 
landscape, wild animals, particularly birds. Forests have high diversity of birds and 
habitats which attract ecotourists. Wild coffee can also be a good attraction for
ecotourism. Even though there is a great potential for ecotourism in the forest areas of the country, the required infrastructure is not in place to host tourists in many parts of the country.

6.2. Future prospects

There are positive local initiatives in ecotourism development, like the case of GTZ-supported community-based ecotourism of Adaba-Dodola in Bale Zone and private investors around Lake Langano. There is a great potential for similar developments in other parts of the forest areas, especially in the southwest coffee forests. Apart from the necessity of infrastructure development, however, there is a need to promote the potential attractions of ecotourism in different forest areas of the country.

7. CONCLUSION AND RECOMMENDATIONS

The NTFPs discussed in this paper have indispensable contribution to both rural households and national economy. The discussion also demonstrates the gradual evolution of the state of knowledge from mere resource conservation to economic benefits. New approaches of increasing income from modernized NTFPs production and development, through public-private partnerships, may boost the level of commercialisation of NTFPs. However, this calls for the exploration of new markets, formulation of quality standards and the adoption of new technologies. Inter alia, recognition of NTFPs in national accounting systems, must be a priority issue in order to assure sustainable forest and forest product development and commercialisation.

Finally, we recommend that more empirical research, based on rigorous economic data, is required to address forest product based rural livelihoods and their concurrent contribution to the national economy. Studies on demand, supply, the exertion of market power, barriers to entry, and the degree of vertical and horizontal integration that determine how competitively poor producers, processors and traders can participate in NTFPs commercialisation are recommended.
References


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Mohammed Adilo, Tadesse Woldemariam, and Abebe Yadessa


