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RESEARCH REPORT

The Profitability of Coffee and Maize among Smallholders

A Case Study of Limu Awraja, Ilubabor Region

Kassahun Seyoum, Gaile Tafesse, and Steven Franzel

Research Report No. 10

INSTITUTE OF AGRICULTURAL RESEARCH

THE PROFITABILITY OF COFFEE AND MAIZE AMONG SMALLHOLDERS: A CASE STUDY OF LIMU AWRAJA, ILUBABOR REGION

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FOREWORD

This publication is the tenth of the Research Report Series of the Institute of Agricultural Research (IAR). Research reports are designed to present findings of the different research activities carried out by the IAR staff. These reports also help to demonstrate to users the application of different methods used to tackle a particular researchable problem. Empirical evidence to substantiate the conclusions is presented.

This research report compares the profitability of coffee and maize among smallholders in Limu Awraja, Ilubabor Region. Profitability is examined from both the farmer's and society's point of view. In addition, the paper examines the relative advantages and disadvantages of the two crops from both the farmer's and society's perspective. It is hoped that the report will prove useful to policymakers, planners and researchers concerned with increasing the productivity of Ethiopian agriculture.

The Institute would welcome any comments and suggestions on the report; they should be directed to the authors.

Seme Debela (Dr.)
General Manager, IAR

SUMMARY

Coffee production has declined significantly in Limu Awraja, Ilubabor Region, in recent years. The objective of this study is to compare the profitability of coffee and maize, the two main crop enterprise of the area. Profitability is examined from the perspective of the farmer ("private profitability") as well as from the perspective of society ("social profitability"). This paper also examines labor use patterns and the relative advantages and disadvantages of the two crops.

Following informal and formal surveys conducted from 1987 through 1989, researchers interviewed 24 farmers in 1989 on the costs and returns of their maize and coffee enterprises. In the analysis of private profitability, all costs incurred and returns earned by the farmers are used. In the analysis of social profitability, distortions caused by government policies are removed. Thus, inputs and outputs are valued at their real costs and values to the economy. For example world reference prices are used to estimate the real value of coffee exports.

The altitude of the survey zone ranges from 1650 m to 1850 m and the topography is hilly. The soils are from red brown to dark brown clays and rainfall averages 1525 mm per year. The area's population is 129 000 and Muslim Oromos predominate.

The major crops include coffee (the main cash crop), maize, enset, and sorghum (the main food crops). Average area cultivated is 0.8 ha, with half under coffee and most of the rest under maize. Most farmers own oxen or a share of an ox; the average number per family is 0.71.

Smallholder coffee is characterized by unpatterned spacing, uncapped, free branch growth, and tree populations over 6000/ha. Shade percentage is about 30% and fertilizer use and planting of new coffee berry disease-resistant varieties are rare. Smallholder yields average about 433 kg/ha of clean coffee. About half of the coffee is sold as fresh red cherry to pulping stations and about half is sold as *jenfel* or dried cherry.

Maize production requires less labor and less capital than coffee production. Maize fields are planted year after year, and crop rotation is not common. Seeds are broadcast after three plowings are done. Fertilizer and improved seed are not available.

Farmers allocate about 235 workdays per hectare to coffee production per year, almost twice as many workdays as allocated to maize. Concerning private profitability, net returns to land, labor, and management for maize are 1175 ETB/ha, which is higher than the net returns for coffee by 273 ETB/ha. Net returns per workday for maize are 8.9 ETB/workday, over 2.3 times that of coffee. Sensitivity analysis shows that the results are stable even when there are significant changes in parameters.

In deciding which crops to grow and how to manage them, farmers take into account many other factors than profitability. Maize is superior to coffee on most of these criteria. For example, maize is better for the farmers in ensuring food security, in providing more flexibility in management and as a complement to livestock production. Coffee, on the other hand, can be stored for longer periods and is more suited to conserving the soil.

The analysis of social profitability shows that coffee is more profitable than maize from society's perspective. Concerning social profitability net returns to land, labor, and management for coffee are 2008 ETB/ha, 41% higher than net returns to maize. Net returns per workday for coffee are 8.5 ETB/workday, still lower than that of maize. Sensitivity analysis shows that the results are not very sensitive to changes in important parameters such as yields, product prices, or the value of foreign exchange.

The differences in the results of the analyses of private and social profitability stem primarily from policy biases against coffee production. Policymakers need to take measures to bring farmers' incentives into line with societal objectives. The following measures are proposed to reverse the decline in coffee production and to stabilize the maize supply in the survey area.

1. Devalue the birr and increase the coffee price paid to farmers. Devaluation can greatly increase the profitability of coffee, permitting the government to pay farmers higher prices.

2. Remove restrictions on grain movement into coffee-producing areas. The government's announcement in March 1990 is encouraging in that these restrictions would be removed.

3. Eliminate "campaign labor" and peasant association's common holdings. The dissolution of the common holdings and most of the producer cooperatives in the survey area in early 1990 goes a long way towards eliminating this problem.

4. Provide secure land tenure. Lack of secure land tenure discourages farmers from making long-term investments in their farms.

5. Intensify the smallholder focus on the Coffee Improvement Project (CIP). The project should emphasize advising farmers on the use of new technologies, not regulating their use.

6. Remove restrictions on coffee marketing. Farmers should be allowed to market their coffee when, where, in what form, and to whom they desire. Policymakers can influence these decisions by changing incentives, particularly prices, to ensure that farmers' decisions are in line with social profitability criteria.

7. Replace the coffee land tax with a tax that does not discriminate among crops.

8. Initiate an on-farm research program for coffee and maize in the survey area. IAR and CIP staff should collaborate in the design, implementation, and evaluation of the program.

1. INTRODUCTION

Coffee is Ethiopia's chief foreign exchange earner, accounting for over 70% of total export earnings. Coffee also accounts for over 30% of the government's total revenue and 25% of total income (Hailu 1986). The peasant sector accounts for over 95% of coffee production; while the rest is produced by state farms. But yields per hectare in the peasant sector are extremely low, averaging from 400 kg/ha to 472 kg/ha of clean coffee (Hailu 1986; MCTD 1989). Yields in the state farm sector average 680 kg/ha and smallholders in Kenya produce 568 kg/ha (Hailu 1986; Roe and Nyoro 1986).

Much effort has been made by different development institutions to increase production in the peasant sector. For example, Jima Research Center (JRC), which has the mandate for coordinating all coffee research in Ethiopia, has been developing new technologies which are being promoted in the peasant sector. Recently, the center has been making use of the farming systems research approach. Researchers gather information about farmers' needs and circumstances, and farmers participate actively in the research process. Researchers develop technologies that increase productivity and that are, at the same time, acceptable and feasible for small farmers.

In 1986/87, Jima researchers conducted a diagnostic survey in Mana and Goma weredas aimed at identifying farmers' problems and developing research programs to address these problems (Kassahun et al. 1988). The study also examined the major reasons behind the decline in area and production of coffee in the survey area. In 1988, researchers conducted a survey of enterprise costs and returns for the area's two most important enterprises, maize and coffee. This report presents the results of the survey.

The objectives of the survey were as follows:

1. to examine labor use patterns in coffee and maize

2. to test the hypothesis developed in the diagnostic survey report that maize has higher returns to land and labor than coffee. This, in part, explains farmers' recent shift in cultivation from coffee to maize and

3. to develop costs and returns analyses for coffee and maize, which are useful for researchers, planners, and policymakers. Profitability is examined from the perspective of the farmer as well as from the perspective of society.

The survey area covers the coffee-growing areas of Mana and Goma weredas, which make up about two-thirds of Limu Awraja (Figure 1.1). This paper begins by explaining the methodology used and examining the farming system of the survey area. Then, maize and coffee profitability from the farmers' point of view are discussed. Next, the relative advantages and disadvantages of coffee and maize production again from the farmers' perspective are presented. Then,

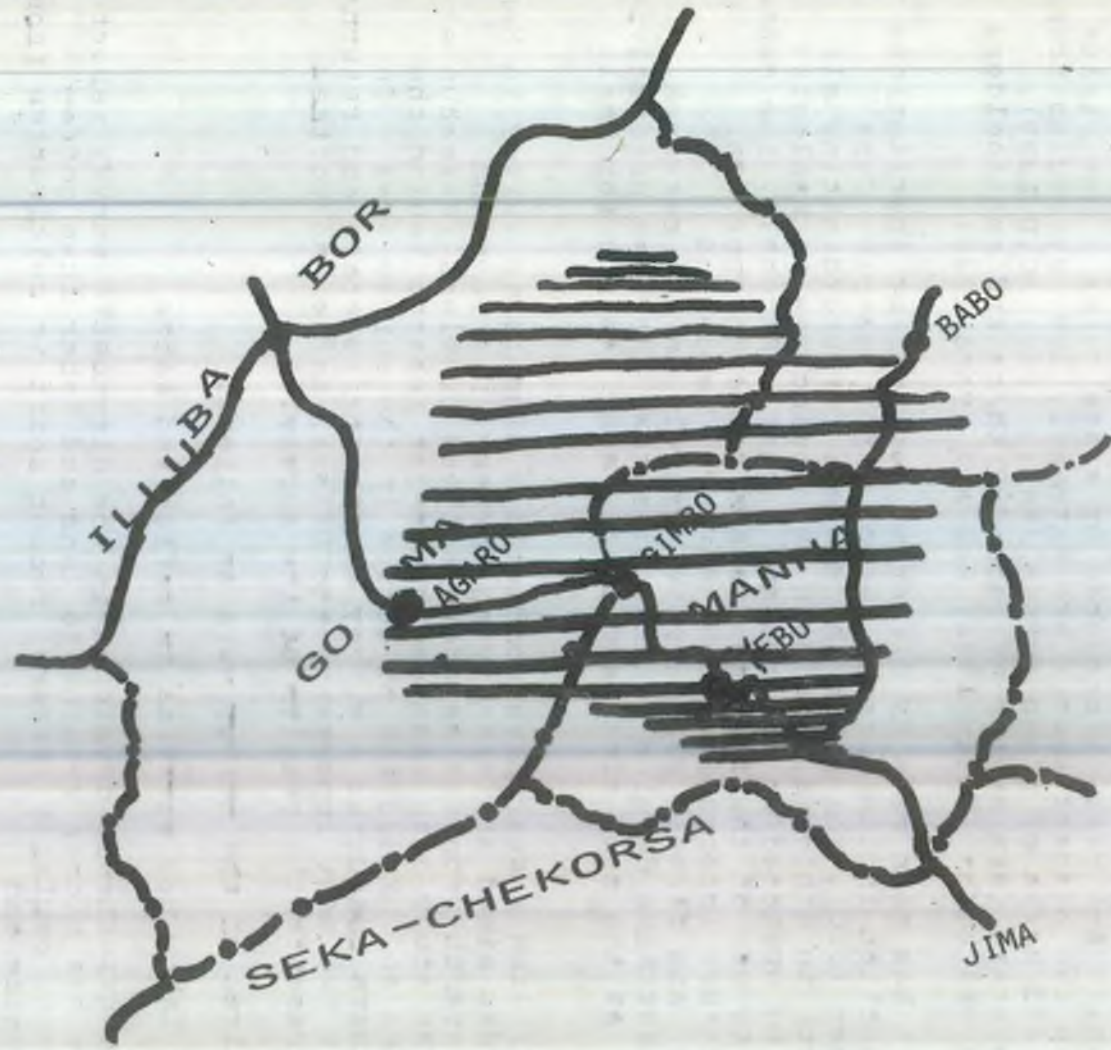

Figure 1.1. Map of survey area

the social profitability of maize and coffee production are compared; in this analysis profitability is examined from society's perspective. Finally, the implications of the analysis for policymakers are presented.

2. RESEARCH DESIGN AND METHODOLOGY

The survey area includes 60 peasant associations (PAs) and 20 service cooperatives. Researchers chose 24 farmers throughout the area and interviewed them concerning the costs and returns they incurred in their maize and coffee enterprises.

The data concerns coffee and maize as currently managed by farmers; no data is available for improved coffee or maize production practices. Since maize production is relatively stable from year to year, one year's data give an accurate picture of its costs and returns. But coffee production is characterized by high yields in one year and low yields in the next year due to its natural growth habit. Therefore, coffee data were collected for both the previous year, 1988/89, which was a year of high yields and 1987/88, a year of low yields. Data collected in the survey included costs (in cash, labor and in kind), returns (production of maize and coffee), and prices of inputs and outputs.

Data were collected using secondary data from previous studies, including the diagnostic survey mentioned above, and the interviews of farmers. Concerning labor, farmers were interviewed in their fields and were asked about the inputs they used in the previous season. Labor amounts were converted to workdays at the rate of 8 hours of adult labor per day. Areas, yields and seed rates were estimated using local units of measurement.

Because of the difficulty of the survey questions, all interviews were conducted by the researchers themselves. Many biases were evident in the farmers responses. For example, some farmers tended to overestimate their costs and underestimate their returns. However, the interviewers employed many methods to avoid these biases. For example, responses were compared to standard norms for the operation in question. In cases where there was much difference, farmers were asked to explain why their figure was higher or lower than the norm.

Check questions were also used extensively. If a farmer, for instance, said that a given operation on his farm took a certain number of workdays, he was asked how many workdays it took to do the operation on a *goro* (0.025 ha). Then the labor input per unit of land was compared with the figure he gave for his own farm. All questions were posed in the context of local units of measurement for all inputs and outputs. In some cases farmers were simply unable to remember or to estimate their costs and returns. Data from these farmers were not used in the analysis of the results.

In compiling the results, data from the interviews were averaged and used to construct three analyses, maize, coffee in a high-producing year and coffee in a low-producing year.

Profitability is examined by using two different approaches: private profitability and social profitability. In the analysis of private profitability, the profitability is measured from the farmers' perspective, that is, all costs incurred and returns earned by the farmers are used. This analysis permits us to examine economic returns to the farmer from a particular enterprise and to compare the profitability of different enterprises to farmers.

But, it is also important to analyze social profitability, that is, profitability from society's point of view (Gittenger 1982; Morris 1988). Market prices of inputs and outputs do not necessarily reflect true economic values. They may be distorted by government policies (as taxes or subsidies) or market failures. In this analysis, distortions caused by government policies are eliminated to show what profits would be earned in the absence of these policies. Inputs and outputs are assigned "social prices" reflecting their true value to the economy. For example, coffee is valued in terms of the foreign exchange it earns for the nation, not in terms of the actual prices paid to farmers. Transportation and handling costs are then subtracted from the world reference price to determine the "export parity price" of coffee in Ethiopia. The value of maize is determined by estimating the cost Ethiopia would have to pay to import maize. The cost is the world market price for maize plus the transportation and handling costs to deliver the maize to Ethiopia. The assumption then is that the value of a ton of maize produced in Ethiopia equals the value of not importing a ton of maize from abroad.

Primary factors of production such as labor and oxen are valued at their actual hiring rates in the survey area. The markets in labor and oxen are assumed to be competitive; the prices farmers pay for labor and oxen in the survey area are assumed to reflect their value to the nation.

Taxes and subsidies are eliminated in the social profitability analysis because they reflect only transfers of income among groups in society but not real benefits or costs to society. For example, the coffee land tax represents an income transfer from farmers to the government. Thus, it is not included as a cost in social profitability.

The valuation of foreign exchange is also an important factor in social profitability analysis. When a currency is overvalued, imported goods become cheaper in domestic currency because they can be purchased with fewer units of the overvalued domestic currency. Unless the exchange rate is adjusted, social profitability analysis will be biased towards import-intensive enterprises (Morris 1988). For example , imported tractors may appear to be a cheaper means of plowing land than oxen if the cost of tractors is computed using the official exchange rate of 2.07 ETB/1 USD. But, in fact, tractors cannot be purchased from abroad using the official exchange rate because foreign exporters would not accept 2.07 ETB for 1 USD. Thus the cost of the tractor is underestimated because the value of the ETB is higher, at the official rate, than its actual value on the world market. In this analysis the Ethiopian birr is valued at a rate

of 3.50 ETB/1 USD (ULG 1989) instead of the official rate of 2.07 ETB/1 USD to reflect the approximate value of the birr if it was traded on the world market.

When compared to the private profitability, social profitability can provide important insights into the impact of government policy on producer incentives. A crop can be unprofitable to farmers (as because of taxes or low-producer prices) even though its production represents an efficient use of resources from society's perspective (Morris 1988).

In both private and social profitability analyses, three different techniques for measuring profitability are used:

1. Net returns to land, labor, and management calculated in birr per hectare.

   In this parameter, all costs except land, labor and management are subtracted from the value of output. Land, labor, and management are treated as residuals in this measure due to the difficulty in estimating their values. In cases where land is the most important constraint, farmers would seek to maximize this parameter.

2. Net returns to land, labor, and management calculated in birr per workday.

   As in the above analysis, land, labor, and management are residuals. In cases where labor is the most important constraint, farmers would seek to maximize this parameter.

3. Net returns to land and management.

   Returns are expressed in birr per hectare and labor is valued at the local wage rate for the particular task being done. In fact, since hired labor is not widely used in the survey area, the wage rate may not be an accurate estimate of the opportunity cost of farmers' labor. Nevertheless, this parameter is presented in this study because planners need estimates in birr of production costs and net returns.

Since both land and labor are important constraints in the survey area, the first and second parameters have approximately equal relevance. In the long run, the first parameter is probably more important, since in future years, labor availability (a function of population growth) will significantly increase whereas cultivated land will not. The third parameter has somewhat less relevance, because the valuation of labor may not be valid.

3. FARMING SYSTEM OF THE SURVEY AREA

Most of the data in this chapter is drawn from Kassahun et al. (1988) and Kassahun and Hailu (1990). The altitude of the survey zone ranges from 1650 m to 1850 m and the topography is hilly. Average rainfall is 1525 mm with most rain falling between March and September. Soils are red brown to dark brown clays, slightly to strongly acidic, and high in N but low in P.

The population of the survey zone is about 129 000 and Muslim Oromos predominate. The area has a relatively well-developed road network, and includes 21 pulping stations for processing washed coffee. When the survey was conducted in 1987, individual farmers used about 88% of the cultivated area, with PA's common holdings accounting for 9% of the cultivated area and producer cooperatives (PCs), for 3%. A new policy, currently being implemented, calls for the common holdings to be distributed to individual farmers. Also, by 1990 most of the PCs had been dissolved and the land distributed to members.

Farmers' principal objectives are:

1) to earn enough cash from production to buy food and other subsistance needs, and

2) to produce some food for home consumption. Farmers' main cash crop is coffee; cash earned from coffee is used to buy much of the family's food supply.

The major crops include coffee (the principal cash crop), maize enset and sorghum (the principal food crops). All farmers grow both coffee and maize. Most farmers own oxen but the sample mean per family is only 0.71 oxen ; it is common for two or three farmers to share ownership of a single ox. Oxen are few due to lack of grazing area and the limited area needed to be plowed. About half of the farmers own cows (0.70 cows per family), whereas less than 10% have other livestock, such as sheep, goats, or equines.

Farm size averages 0.8 ha; about half of the area is allocated to coffee production and most of the rest to maize production. Family labor is sometimes supplemented by exchange labor or hired labor. The busiest periods of the year are from September through December (coffee and maize harvesting) and from April through June (coffee and maize weeding) (Figure 3.1). Coffee accounts for about 60% of the total labor inputs in crop production. Until 1990, farmers were obliged to provide 2-3 days per week working on the PA's common holdings as well as giving unpaid labor to PCs and state farms. For the last 10 years, farmers have worked on the common holdings without being paid. Extremely low payments began in 1987 averaging 9 ETB/year per farmer.

The coffee of smallholders is characterized by unpatterned spacing, uncapped, free growth, and tree populations over 6000/ha. Shade percentage is about 30%, fertilizer use and planting of new,

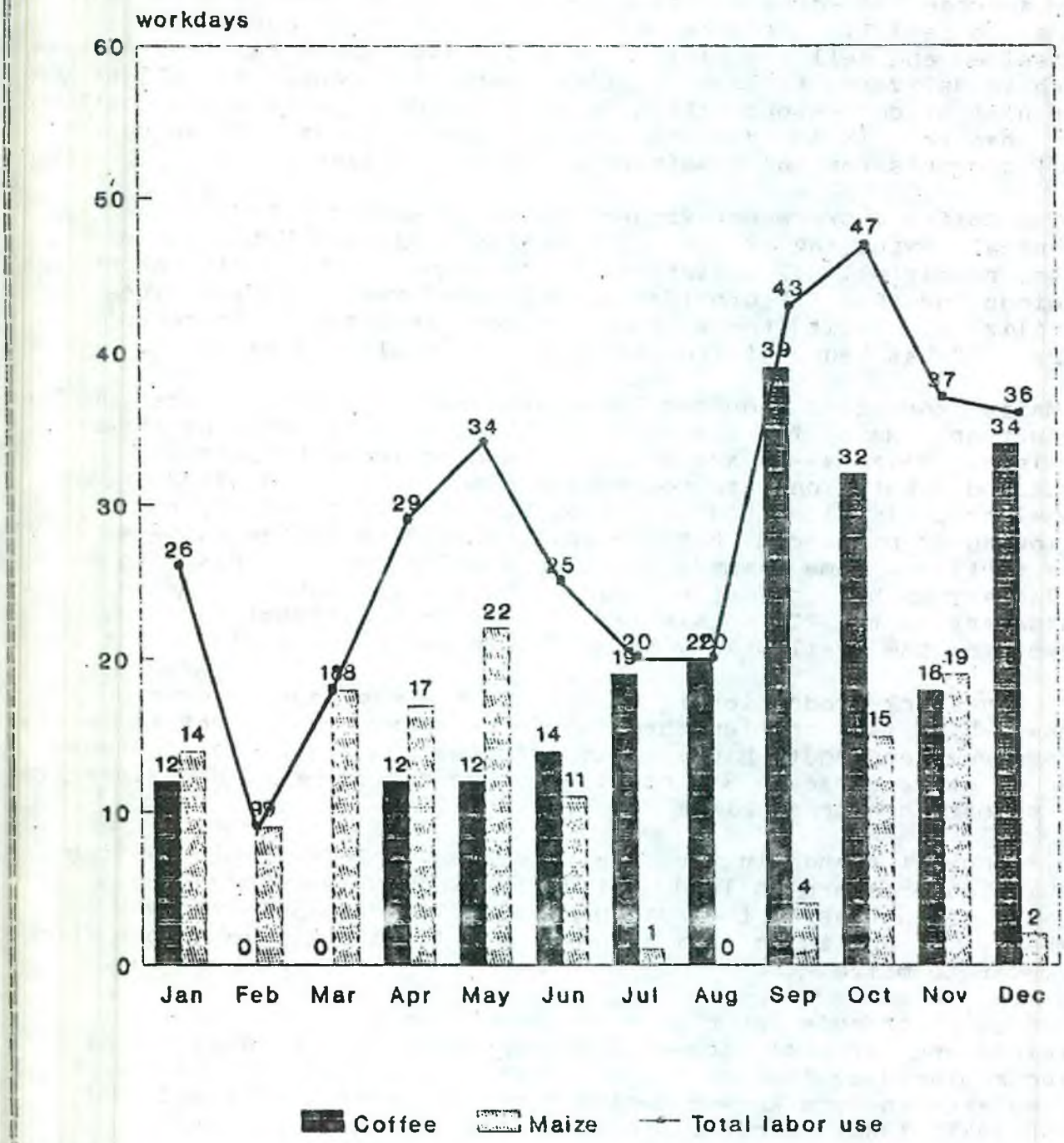

Figure 3.1. Monthly labor use profile for maize and coffee, per hectare Manna-Gomma area.

Coffee Berry Disease (CBD)-resistant lines are rare. CBD is the primary production problem to farmers. Smallholder yields average about 433 kg of clean coffee/hectare. But, in high-yielding years they average 598 kg/ha and in low-yielding years become about 268 kg/ha (Table 3.1). Farmers consume about 20 kg of coffee per year themselves and sell the rest. Table 3.1 also shows that red cherry, which is delivered to local pulping stations,accounts for slightly over half of coffee production in high-yielding years and slightly less than half in low-yielding years. *Jenfel* (dried coffee cherry or *buni*) accounts for the remaining coffee production.

The Coffee Improvement Project (CIP) is mandated to provide technical advice and training for coffee farmers. Until the mid-1980s, nearly all CIP assistance was reserved for the PAs common holdings and PCs. CIP provided seedlings of CBD-resistant lines, fertilizers, credit, tools, and technical assistance. In recent years, CIP has begun giving assistance to smallholders.

Maize production requires less labor and less capital than coffee production. Maize is planted in March after an average of three plowings. Maize seeds are broadcast and no intercropping is practiced. Rotations are not common since most of the land under annual crops is allocated to maize. Due to land shortage, no fallowing is practiced. But the soil, according to the farmers, is very fertile. Some farmers practice double-cropping, planting maize in January in bottom fields followed by tef in August. Maize management on the PCs is similar to that of individual farmers, except for the availability of more oxen and the use of fertilizer.

Livestock production is inhibited by a shortage of grazing areas, which is a problem throughout the year. Management is fairly intensive, leading to higher calving rates and weaning percentages than in other areas in Ethiopia. Blackleg and internal parasites are the primary health problems.

Principal trends in the farming system include (1) increasing population pressure on land, (2) decreasing coffee production at the expense of increasing food production, (3) declining livestock numbers, (4) declining farm incomes, and (5) a shift in staple food from tef to maize.

Despite coffee's importance to the nation's foreign exchange earnings and farmers' income, its production is declining and is being replaced by food crops (Kassahun et al. 1988; CIP 1986). Coffee area in Kefa Region declined by 44% between 1977 and 1985 (MCTD 1977, 1985). Coffee production is declining sharply for several reasons.

1. Food prices are increasing relatively to coffee prices, causing a shift to food production, particularly, maize. For example, the ratio of coffee price to maize price decline from 7.25 over the period 1976-1979 to 4.5 over the period 1984 to 1987 (ULG 1988).

2. Production and marketing controls on coffee discourage farmers' production. Farmers are required to supply quotas of coffee to pulping stations; whereas no control measures exist concerning the production of food crops in the survey area. Moreover farmers are not allowed to take coffee outside of their home area to sell in consumer areas, where prices are often three to five times higher than in their home areas.

3. Until 1990, there were excessive demands for the farmer's time working on the common holdings, PCs, and state farms. Farmers thus shifted to food crops because they are less labor-intensive.

Table 3.1. Coffee yields in the smallholder sector, Mana-Goma survey area, in (1987/88 - 1988/89)

	Low-yielding year 1987/88		High-yielding year 1988/89		Average year
Types	kg/ha	clean coffee equivalent (kg/ha)	kg/ha	clean coffee equivalent (kg/ha)	clean coffee equivalent (kg/ha)
Red cherry	723	127(47%)	1808	316 (53%)	221(51%)
Jenfel	301	141(53%)	601	282 (47%)	211(49%)
Total	-	268(100%)	-	598 (100%)	433(100%)

Source: Survey data

Conversion factors (Coffee department progress report, 1985/86)
1. Cherry to clean coffee: (cherry x 0.175)
2. *Jenfel* to clean coffee: (*Jenfel* x 0.47)

4. There is no secure land tenure; farmers are thus not interested in making long-term investments. In a survey in 1989, 32% of the farmers reported that they had lost some part of their coffee farms during the previous 5 years (Kassahun and Hailu 1990).

5. Farmers report that CBD is increasing in severity.

4. LABOR USE IN COFFEE AND MAIZE PRODUCTION

Coffee and maize take nearly all of the labor input used in agricultural production in the survey area. Figure 3.1 shows a monthly labor profile for maize and coffee, that is, the amount of labor the average family uses on maize and coffee production per hectare. Figure 3.1 also shows that farmers allocate far more labor to coffee than maize on a per hectare basis.

Labor use in both crops is highly skewed. For example, labor use for coffee during the two busiest months accounts for 34% out of the total; for maize, labor use during the two peak months accounts for 31%. Two peak labor periods are noted in the figure:

1. The most important is from September through December, the period of coffee slashing, coffee harvesting and maize harvesting, and

2. April through June, when farmers plant, weed, and slash in maize and turn the soil under coffee.

Until 1990, farmers have been working on the common holdings as well as on their own fields both peak periods, Some have also been required to work on state farms and PCs. Farmers meet the labor demand in the peak months by using exchange labor, working long hours, or hiring labor.

5. PROFITABILITY OF COFFEE AND MAIZE: FARMERS PERSPECTIVE

This section estimates the costs and returns of smallholders' coffee and maize production on a per hectare basis. All costs incurred and returns earned were based on the actual coffee and maize holdings of farm families and were converted to per hectare basis. The analysis assesses private profitability, that is, profitability from the farmer's point of view. The costs and returns shown are those that the farmer actually incurs or receives.

In this analysis, a workday is equal to 8 hours. The analysis is conducted in two ways: by assuming all family labor and the other is by assuming all hired labor. The first way is more realistic since most farmers use only family labor. The second approach is useful because all operations are transformed into cash costs. Wages vary by operation; average local wage rates paid by the farmers for each operation were used in the analysis. Wages could not be obtained for some tasks (like shelling maize) since these are done using only family labor. In the analysis assuming wage labor, these tasks are cost at 2 birr/day for adult labor and 1 birr/day for child labor.

The average number of hours the laborers work per day varies depending on the operation. In this analysis, all operations have been converted into costs per 8 hour in a workday. For some operations, laborers are given lunch and coffee; the meal in this analysis is valued at 0.50 birr per workday.

Costs and returns analysis for coffee.

Table 5.1 shows the value of output from coffee production among smallholders; Table 5.2 presents costs and returns from coffee for high- and low-yielding years. The notes to the tables explain how the costs and returns were calculated.

Table 5.1. Value of output from coffee production among smallholders per hectare

Type	Low-yielding year 1987/88		High-yielding year 1988/89		Average year	
	Output (kg)	Birr	Output (kg)	Birr	Output (kg)	Birr
Red cherry	723	361.60	1808	904.00	1266	632.80
Jenfel	301	285.48	601	570.95	451	428.21
Total	-	647.08	-	1474.95	-	1061.01

Notes to Table 5.1

Yield data. Yield data were collected by interviewing randomly chosen farmers (Kassahun et al. 1990). Farmers reported the total number of kilograms of red cherry delivered to the pulping station. Records from pulping stations were examined to confirm farmers' data. Farmers also reported on the quantity of *jenfel* they sold. But, the quantity of *jenfel* used for home consumption was estimated based on interviews with women. An average of 55 g of coffee is used per preparation. The average family prepares coffee once per day. Thus, total home consumption averages 20 kg/family per year.

As explained in Chapter 3, coffee yields are high and low in alternate years. Conversion factors between red cherry and *jenfel* and clean coffee are shown in the notes to Table 3.1.

Output price. Farmers receive two payments per year for their red cherry. The price for the first payment has averaged at 0.45 birr/kg for the last 3 years; the second payment has averaged about 0.05 birr/kg over the past 3 years. Most of the *jenfel* is sold in local markets; the average price over the last 3 years is 0.95 birr/kg.

Output in coffee production includes red cherry and *jenfel*. Costs include labor, tools, and the coffee land tax. It should be noted that no installation costs (costs of preparing land, digging holes, planting trees, etc.) are included because farmers do not incur any installation costs. Farmers were given coffee plantations following the land reform of 1975; additions to coffee farms have been rare since that time.

Labor use in coffee ranges from 229 workdays/ha in low-yielding years to 242 workdays/ha in high-yielding years. The activities that use relatively more labor are slashing, harvesting red cherry, and harvesting *jenfel*. More labor is used in high-yielding years because harvesting requires more labor. Table 5.2 also shows that harvesting *jenfel* requires more labor in low-yielding years than in high-yielding years because *jenfel* is collected from the ground and labor operates much less efficiently when yields are low (Appendix 1).

The analysis shows that net returns to land, labor, management, (that is, net returns without costing land, labor or management) average 902.2 birr/ha. Returns are 2.7 times higher in high-yielding years than in low-yielding years, mainly because of higher output in high-yielding years.

Table 5.2 also shows net returns per workday, that is, net returns divided by the number of days worked. Net returns per workday are 2.5 times higher during high-yielding years than during low-yielding years. The average of high- and low-yielding years is 3.83 birr/workday. This is higher than the average wage rate for the area, about 2.25 birr/workday (including lunch). This is as expected; the extra 1.03 birr/ha represents the return to land and management.

Table 5.3 shows the costs and returns analysis assuming that all costs, including labor, are valued in cash. This analysis is hypothetical since few farmers hire labor for more than a small percentage of their labor requirements. Nevertheless, it is useful for planners to convert labor in terms of birr so as to calculate the net returns to land and management in birr. Net returns to land and management in this analysis average 346.35 birr (716.98 birr/ha in high-yielding years and -24.27 birr/ha in low-yielding years).

Table 5.2. Costs and returns analysis for coffee production among smallholders per hectare

Items	Low-yielding year 1987/88		High-yielding year 1988/89		Average year	
	Workdays	Birr	Workdays	Birr	Workdays	Birr
Value of output		647.08		1474.95		1061.01
Variable labor costs						
Slashing	75	-	75	-	75	-
Turning soil	24	-	24	-	24	-
Harvesting red cherry	66	-	82	-	74	-
Transporting red cherry	4	-	6	-	5	-
Harvesting *jenfel*	60	-	55	-	57	-
Subtotal	229	-	242	-	235	-
Fixed costs						
Tools	-	32.21	-	32.21	-	32.21
Coffee land tax	-	105.50	-	105.50	-	105.50
Interest on land tax	-	21.10	-	21.10	-	21.10
Total fixed costs	-	158.81	-	158.81		158.81
Net returns (to land, labor, and management)						
Birr per hectare	-	488.27	-	1316.14	-	902.2
Birr per workday	-	2.13	-	5.44	-	3.83

See notes following Table 5.3.

Table 5.3. Costs and returns analysis for coffee production among smallholders assuming labor valued in cash

Items	Birr per hectare		
	Low-yield year	High-yield year	Average year
Value of output	647.08	1474.95	1061.01
Variable labor costs			
Slashing	171.00	171.00	171.00
Turning soil	47.00	47.00	47.00
Harvesting red cherry	166.34	232.57	199.46
Transporting red cherry	8.00	12.00	10.00
Harvesting *jenfel*	120.20	136.59	128.40
Total variable labor cost	512.54	599.17	555.85
Fixed costs			
Tools	32.21	32.21	32.21
Coffee land tax	105.50	105.50	105.50
Interest on land tax	21.10	21.10	21.10
Total fixed costs	158.81	158.81	158.81
Total costs	671.35	757.98	714.66
Net returns to land and management	-24.27	716.98	346.35

Notes to tables 5.2 and 5.3

Value of output See notes to Table 5.1.

Slashing Slashing is done three times per year, primarily to control weeds and to clear the ground for harvesting. Payment is usually done on a contractual basis at the rate of 57 birr/ha per slashing.

Turning soil This task is done once in 3 years. Contractual payment is 140 birr/ha or 47 birr/year.

Harvesting red cherry and *jenfel* Estimating harvesting labor is very difficult because harvesting is done intermittently over a long period of time. Harvesting costs are discussed in Appendix 1.

Transporting red cherry In high-yielding years, it is assumed that one person transports red cherry to the pulping station 45 times, taking 1 hour per trip. In low-yielding years, 32 trips are made.

Tools See Appendix 2.

Coffee land tax Farmers pay a coffee land tax of 105.50 birr/ha.

Interest on capital 20%

Net returns (to land, labor, and management) It is "Value of output" minus "Total other costs". Land, labor, and management are not costs in this analysis.

Net returns (to land, labor, and management) per workday This is calculated as follows: (Value of output - total other costs)/Workdays.

Net returns to land, capital, and management This is calculated as follows: "Value of output" minus "labor costs" minus "total other costs."

Costs and returns analysis for maize

Table 5.4 shows costs and returns for maize in the 1988/89 production season, a representative year for maize production. The value of maize output is the grain yield produced. Costs include labor, oxen, seed, and tools. The notes to the table explain how costs and returns were calculated.

Labor use in maize production averages 132 workdays per year. The activities taking the most labor are plowing, hoeing, and harvesting.

The analysis shows that net returns to land, labor, and management, (that is, net returns without costing land, labor, management) are 1175.25 birr/ha. Net returns per workday, that is, net returns divided by the number of days worked are 8.90 birr/workday. This is about four times higher than the average wage rate for the area, about 2.25 birr/workday (including lunch). This figure shows the high profitability of maize production in the area.

Table 5.5 shows the costs and returns analysis assuming that all costs, including labor costs, are valued in cash. As was discussed in the profitability analysis of coffee, this assumption is not realistic. However, it provides useful data for planners so as to show enterprise net returns in birr. Net returns to land and management in this analysis averages 823.03 birr/ha.

Table 5.4. Costs and returns analysis for maize among smallholders

Items	Per hectare	
	Workdays	Birr
Value of output		1512.00
Variable labor costs		
Plowing	24	-
Planting/pulling weeds	13	-
Hoeing	24	-
Shilshallo	15	-
Slashing	8	-
Harvesting	23	-
Guarding	13	-
Transporting	2	-
Shelling	10	-
Total variable labor costs	132	-
Other variable costs		
Oxen		244.00
Seed		48.00
Total other variable costs		292.00
Fixed costs		
Tools		44.75
Net returns (to land labor, and management)		
Birr per hectare		1175.25
Birr per workday		8.90

/ See notes following Table 5.5.

Table 5.5. Costs and returns analysis for maize among smallholders (assuming labor is valued in cash)

Items	Birr per hectare
Value of output	1512.00
Variable labor costs	
Plowing	96.00
Planting/pulling weeds	32.50
Hoeing	40.00
Shilshallo	60.00
Slashing	16.00
Harvesting	57.50
Guarding	26.00
Transporting	4.00
Shelling	20.22
Total labor costs	352.22
Other variable costs	
Oxen	244.00
Seed	48.00
Total other variable costs	292.00
Fixed costs	
Tools	44.75
Total costs	688.97
Net returns (to land, and management)	823.03

Notes to tables 5.4 and 5.5 (see following page)

Value of output

Yield data Yield data were collected through interviewing farmers. For the main harvest, farmers were aware of the yields obtained and gave data in local units of measurement. Farmers' estimates of area are also accurate; local units of area were measured and converted to hectares. Yields per hectare were estimated to be 2700 kg/ha. These were roughly the same as the data found in other studies. In on-farm trials near the study area, unfertilized maize yields were 2900 kg/ha. Average smallholder maize yields in Limu Awraja were 2373 kg/ha in 1987 (Central Statistics Authority 1989).

Output price Average price for maize in Afeta market, 1988-1989, was about 56 birr/100 kg. The price range during the year was 42 birr/100 kg to 70 birr/100 kg.

Labor costs

Plowing Farmers plow three times including the covering of seeds. The wage rate is 2 birr/4 hours.

Planting/pulling of weeds Farmers broadcast maize and pull weeds as the seed is being covered. The wage rate is 2 birr per day plus lunch.

Hoeing Hoeing is done once to control weeds and aerate the soil. On a contractual basis, farmers pay 40 birr/ha.

Shilshallo *Shilshallo* (or oxen cultivation) is done to control weeds and to heap the soil around the plants in order to protect against lodging. Maize is *shilshalloed* three times. Laborers are paid 2 birr/4 hours.

Slashing Slashing is done on a contractual basis for 16 birr/ha.

Harvesting Farmers harvest by dehusking and cutting the stalk. Laborers are paid 2 birr plus lunch per day.

Guarding Maize remains in the field to dry about 9 days and family members guard the maize. During the day, children guard the maize; at night adults sleep in the field.

Transport Maize is carried manually to the homestead.

Shelling It takes about 3 hours to shell 100 kg of maize.

Other costs

Oxen Oxen are used for plowing (37 days) and *shilshalloing* (24 days). For plowing, oxen work approximately 5 hours/day. The first plowing requires 14 days, the second plowing 13 days, the third plowing 10 days. Oxen efficiency in the survey area is low compared to other areas in Ethiopia because of the hilly nature of the land and the presence of many tree stumps.

Farmers shilshallo three times, oxen work 8 days per *shilshallo*, working 5 hours/day.

Since most farmers do not own a pair of oxen, the cost of oxen is treated as a variable cost. An oxen day (5 hours) is valued at 4 birr per oxen day because farmers obtain the use of a pair of oxen for one day in exchange for two days of their labor. A day of labor during plowing is valued at 2 birr.

Seed cost Farmers' seed rate is about 68 kg/ha. Seed price at planting time averages 70 birr/100 kg.

Tools See Appendix 2.

Net returns For definition of net returns measures, see notes following tables 5.2 and 5.3.

6. COMPARISON OF COFFEE AND MAIZE: FARMERS' PERSPECTIVE

This chapter compares the private profitability of maize and coffee, that is, profitability from the farmer's point of view. Sensitivity analysis is also conducted to test the sensitivity of the results to changes in the parameters used in the analysis. The advantages and disadvantages of coffee and maize production from the farmers' perspective are examined as well.

Private profitability of maize and coffee

Table 6.1 compares the private profitability of maize and coffee. Costs and returns are brought from tables 5.1 through 5.5. Coffee costs and returns are averages of low- and high-yielding years.

Value of output for maize is 1512 birr, 1.4 times higher than coffee. Labor costs for coffee are higher than for maize by 1.6 times in terms of cash and 1.8 times in terms of workdays. However, other variable costs are higher for maize, primarily due to the use of oxen in its production. Fixed costs are higher for coffee owing to the land tax paid by coffee farmers.

Net returns to land, labor and management for maize are 1175 birr/ha for maize; 273 birr higher than net returns for coffee. Net returns to land, labor, and management per workday for maize are 8.90 birr/workday, over 2.3 times that of coffee (3.83 birr/workday). The average wage rate in the area is about 2.25 birr/workday; maize returns per workday are 3.9 times higher than the average wage rate and coffee returns are 1.7 times higher. The higher net returns per workday for coffee and maize reflect the returns above costs to land, labor and management.

The results on the profitability of maize and coffee are consistent with those reported in other studies (Appendix 3). World Bank (1987) reported the net returns of maize per workday to be 6.65 birr and coffee to be 2.35 birr, the ratio between maize and coffee net returns is 2.8:1, almost the same as in our findings. The

World Bank (1987) study was for Kefa as a whole. Hence, maize prices and yields were lower than the ones used in our analysis (Appendix 2). This accounts for the lower maize returns. In the World Bank study, coffee returns are found to be low due to higher labor estimates. A study of maize and coffee profitability in the Gimbi area in Welega Administrative Region has found maize to be 1.9 times more profitable than coffee in terms of net returns per workday. (Coffee Improvement Project 1986). Another study has found the returns per workday for maize in Kefa to be 10.7 birr, but has not estimated coffee returns (ULG 1988).

Table 6.1. Comparison of costs and returns of coffee and maize among smallholders

Items	per hectare	
	Coffee*	Maize
Value of output (birr)	1061.01	1512
Labor (workdays)	235	132
Labor (birr)	555.85	352.22
Other costs (birr)	158.81	336.75
Net returns to land, labor and management		
Birr per hectare	902.20	1175.25
Birr per workday	3.83	8.90
Net returns to land and management (birr)	346.35	823.03

Source: Computed from tables 5.1 through 5.5

* Coffee cost and returns are averages of low- and high-yielding years.

Sensitivity analysis

Sensitivity analysis was also done to determine the extent to which the profitability of maize and coffee are affected by changes in assumptions about prices, yields or other parameters. Table 6.2 compares the profitability of maize and coffee under the following assumptions:

1. A 25% increase in coffee yields, from 433 kg/ha to 542 kg/ha. The national average is 400 to 472 kg/ha (Hailu 1986; MCTD 1989).

2. A 25% increase in the coffee price, from 2.45 birr/kg clean coffee to 3.06 birr/kg clean coffee.

3. A 25% decrease in maize yields, from 2700 kg to 2025 kg/ha.

4. A 25% decrease in the maize price from 56 birr/100 kg to 42 birr/100 kg.

If coffee yields or prices increased by 25%, net returns to land, labor and management would become equal for coffee and maize. However, maize's net return to labor per workday would still be about double that of coffee, because coffee is so much more labor-intensive than maize. Net returns to land and management would also be 35 - 55% higher for maize.

Table 6.2 Sensitivity analysis for changes in yield, price, and other parameters

Items	Net returns to labor, land and management		Net returns to land and management
	Birr/ha	Birr/workday	Birr/workday
Coffee returns	902.20	3.83	346.35
Impact of changes on coffee returns			
Coffee yield increases by 25%	1167.46	4.35	529.64
Coffee price increases by 25%*	1167.46	4.96	611.61
Coffee land tax removed	1007.70	4.28	451.85
Coffee labor decreases by 25%	902.20	5.13	802.93
Maize returns	1175.25	8.90	823.03
Impact of changes on maize returns			
Maize yield decreases by 25%	797.25	6.23	454.25
Maize price decreases by 25%	797.25	6.03	445.03

Source: Computed from tables 5.1 through 5.5
* Red cherry price world rise to 1.20 birr/kg and *jenfel* to 2.28 birr/kg

If maize yields or prices decline by 25%, the net returns to land, labor and management for maize would fall to a level of 100 birr less than coffee. However, net returns per workday and net returns to land and management would remain 30-60% higher for maize than coffee.

It should be noted that policymakers have other measures at their disposal, aside from raising coffee prices and yields, for increasing the profitability of coffee relative to maize. For example, in 1990 restrictions on the movement of maize into the

coffee-producing areas were eliminated; this would likely reduce the price of maize and thus its profitability relative to coffee. Also, the tax on coffee land could be ended. Table 6.2 shows that elimination of the coffee land tax would raise coffee's net returns to land, labor and management by 12%, net returns per workday by 12%, and net returns to land and management by 30%.

Table 6.2 also shows the effect of reducing the estimation of coffee labor use per hectare. Even if coffee labor use is reduced by 25%, net returns per workday for coffee are still less than 60% than those of maize. Net returns to land and management for the two crops would be almost equal.

Relative advantages of coffee and maize

Profitability is only one criteria farmers use in deciding how much of different crops to grow and how intensively to manage each one. Other criteria which affect farmers' management strategies are presented in Table 6.3.

Market regulations Marketing conditions act as a strong disincentive to coffee production. The coffee marketing system is strictly controlled by the state. Farmers have almost no say as to whom, when, where and at what price they can sell the coffee. Farmers in the survey area are required to sell all of their red cherry to state-owned pulping stations. They are not permitted to store their coffee as *buni* and sell it when they prefer to do so.

On the other hand, maize marketing in the survey area is not subject to regulation. Prices are determined in open markets by supply and demand conditions. Farmers can sell maize at the harvest time or store and sell it at any time to whoever they want.

Price variability Coffee prices are fixed by the state and are very stable whereas maize prices vary considerably from season to season and from year to year. For example, in Agaro market near the survey area, maize prices varied from 31 birr/100 kg to 97 birr/100 kg during 1986. Farmers are dependent on the market for maize; the higher the price variability, the greater the advantage of being self-sufficient in maize. High variability in maize prices thus encourages farmers to grow more maize.

Yield variability Coffee yields vary from year to year due to coffee's growth pattern; high-yielding years alternate with low-yielding years. On the other hand, maize yields are relatively stable from year to year. Since there is little uncertainty concerning the yield of maize and coffee, yield variability does not act as an incentive or disincentive to production.

Table 6.3 Farmers' criteria to decide on growing more maize or coffee

Criteria	Coffee	Maize
Profitability	-	+
Market regulations	-	+
Price variability	0	+
Yield variability	0	0
Susceptibility to hazards	-	+
Food security	-	+
Returns from using technologies	-	0
Asset fixity	-	+
Land tenure	-	+
Complementarity to livestock production	-	+
Storability	+	-
Soil conservation	+	-

Notes:
+ acts as incentive for increasing production
- acts as disincentive for increasing production
0 neutral

Susceptibility to hazards Coffee income is more greatly affected than maize by uncertainties in production. Coffee berry disease (CBD) has a severe impact on coffee production while there are no important maize pests or diseases except wildlife. But, the damage is less than that incurred on coffee by CBD. Rainfall is very stable from year to year so it is not an important cause of production uncertainty in either crop.

Food security Farmers give great importance to food security. currently much of their food supply come from purchases made from the sale of coffee. However, supplies of maize in the market are unreliable; until 1990 traders were forbidden to bring maize into the area from nearby surplus-producing areas. Since maize prices fluctuate greatly and supplies are uncertain, farmers prefer to have their own farm produced supply of maize rather than buying maize in the market.

Returns from using new technologies Farmers ascertain that new technologies to improve coffee production tend to decrease their income, at least in the short run. For example, stumping of coffee or replacing with new CBD-resistant lines will deprive farmers of income from those trees for at least 3 years. Improved maize technologies, such as improved varieties and fertilizers, are not available in the survey area.

Asset fixity Coffee plantations are fixed assets; once established, farmers cannot easily change their production to a different crop. But with maize, on the other hand, they can easily change production to another crop if they prefer and this is why farmers like the flexibility which maize production offers them.

Land tenure Farmers lack secure land tenure. In recent years many have had their coffee farms taken by the expanding PCs or by PA common holding farms. As a result, they are reluctant to make a long-term investment in their farms which coffee production requires. They prefer investments that result in short-term gains as in maize production. Moreover, in the past PCs and PA common holding farms have tended to take smallholder coffee farms more frequently than smallholder maize farms. Thus, farmers prefer investing in maize to coffee production.

Complementarity to livestock production Maize production is complementary to livestock production since livestock can be fed on maize stalks and graze on maize fields after harvest. The use of maize by-products for animal feed is especially important because there is a shortage of livestock feed in the area. Coffee production, however, does not make any direct contribution to livestock production.

Storability Maize is highly susceptible to weevil attack and thus may be stored for only short periods. Coffee, on the other hand, has no important storage pests and may be stored for long periods. Thus, farmers prefer to depend on coffee as a means of saving money.

Soil conservation The topography in the survey area is very hilly and the soils are highly erodable. The forest cover is rapidly declining severely increasing soil runoff. Maize cultivation leaves the soil exposed to erosion; while coffee protects the soil. Thus, soil conservation is an important relative advantage of coffee over maize even though farmers do not mention it when discussing the trade-offs between coffee and maize production.

The above arguments show that on both profitability and other criteria, farmers prefer maize to coffee production.

7. PROFITABILITY OF COFFEE AND MAIZE: SOCIETY'S PERSPECTIVE

Up to this point, profitability analysis has been from the farmers' point of view, that is, private profitability. But, it is equally important to analyze social profitability, that is, profitability from society's point of view. In this analysis, distortions caused by government policies are eliminated to show what profits would be earned in the absence of these policies. Income transfers such as taxes are also eliminated in social profitability analysis since they reflect transfers of income among groups in society, not real benefits to society.

The following adjustments have been made to the enterprise costs and returns calculated in tables 5.1 through 5.4:

1. Foreign exchange is valued at 3.5 ETB per U.S. dollar, instead of the official rate of 2.07 ETB per U.S. dollar. The higher rate better reflects the real value of foreign exchange in Ethiopia. This rate is approximately the same as the average of the black market rate and the official rate during 1989 and has been used by international organizations in project appraisals (ULG 1989).

2. Maize and coffee are valued at their social prices, that is, at prices that reflect their value to society. The reference point for valuing maize is based on the price Ethiopia should have to pay to import maize instead of producing it locally. The reference point for calculating the social price of coffee is based on the price Ethiopia is paid for its coffee on the world market. The calculations of the social price of maize and coffee are shown in tables 7.1 and 7.2.

Other values used in the cost and returns analysis such as the costs of labor, oxen, seed, and tools are not adjusted for they are assumed to reflect the real costs to society of using these inputs.

Table 7.3 compares the social profitability of coffee and maize. The value of output for coffee is higher than maize by 16%. Labor costs are higher for coffee than maize. Non-labor costs, on the other hand, are higher for maize. Net returns to land, labor and management for coffee calculated in birr per hectare, are higher than maize by 41%. In terms of birr per workday, returns are 26% higher for maize. Net returns to land and management are 35% higher for coffee.

From the farmers point of view, maize is far more profitable than coffee (Table 6.1). However, from society's point of view, coffee offers more benefits than maize in terms of net returns per hectare. In terms of net returns per workday, maize is more profitable. In the long run, land will probably be a more serious constraint than labor. Therefore, the first measure, net returns per hectare, is of particular importance.

In conclusion, policy distortions are deterring farmers from practicing what is best for the Ethiopian economy. Current policies

Table 7.1 Calculation of the social price of maize in the survey area

Items	Per tonne of maize (USD)	Per tonne of maize (ETB)
Maize price, Gulf ports, USA	120.00	
Transportation and other costs to move grain to Asab	45.00	
CIF price, Asab	165.00	577.50
Port charges		60.00
Storage and handling		15.00
Cost to transport maize from Asab to deficit area in Ethiopia		150.00
Social price of maize in deficit area		802.50
Cost to transport maize from survey area to deficit area		150.00
Social price of maize in the survey area		652.50

Notes:

1. Maize price, Gulf ports, USA is the average monthly price of maize for the period July 1988 through June 1989 (USDA 1989).

2. Transportation costs from USA to Assab are from ULG 1988.

3. CIF (costs, insurance and freight) price at Asab. Exchange rate: 3.5 ETB = 1 USD (ULG 1989)

4. Port charges and storage and handling costs are from ULG 1988.

5. Transportation costs are from the port to the deficit area and from the survey area to the deficit area. It is assumed that most additional maize produced in the survey area would be exported to other maize-deficit areas of Ethiopia, like in southern or eastern Ethiopia. The cost of transporting maize from Asab to the deficit areas is added on to the social price of maize in the survey area whereas the transporting cost from the survey to the deficit areas is subtracted from the social price. On average, these two costs are about equal.

Table 7.2 Calculation of the social price of coffee in the survey area

Items	Price per tonne of coffee (ETB)
Jima coffee FOB, Asab	5775
Costs, terminal market to port	
Cleaning	54
Weight loss	168
Bags	50
Handling	50
Transportation	184
Miscellaneous	10
Subtotal	516
Costs, farm to terminal market	
Hulling	60
Bags	70
Finance	10
Weight loss	134
Transportation	276
Subtotal	550
Total costs	1067
Social price of coffee, farmgate	4708

Notes:

The analysis is for *jenfel* coffee, both the FOB (Free on Board) price and the costs would be higher for washed coffee and the social price at farmgate would be roughly the same.

1. FOB price is the export price at Asab paid for Jima coffee in February 1989 (MCTD, Pers. Comm.). The exchange rate is assumed to be 3.5 ETB/$1 USD.

2. Costs are from ULG 1988. The value of coffee losses was reduced by one-third, as the world coffee prices have declined by about one-third since the writing of the study.

3. Social price of coffee, farmgate, is the FOB price, Asab, minus the costs incurred from the farm to the port.

4. Taxes, such as the coffee land tax, are not included in the analysis since they reflect income transfers from coffee farmers to the government.

Table 7.3. Social profitability of maize and coffee

Items	Birr/hectare	
	Coffee	Maize
Value of output	2040.20	1761.75
Labor (workdays)	235	132
Labor (in birr)	555.85	352.22
Other variable costs	0	292.00
Fixed costs	32.21	44.75
Net returns to land, labor, and management	2007.99	1425.00
Net returns to land, labor, and management per workday	8.53	10.79
Net returns to land and management	1452.14	1072.78

Notes:
Value of output: Prices of maize and coffee are from tables 7.1 to 7.2. Labor data, other variable costs, and fixed costs are from Tables 5.1 and 5.3.

promote maize over coffee production. But, society would more benefit if farmers gave more emphasis to coffee production.

Table 7.4 presents the sensitivity of the results of the social profitablility analysis to changes in prices of foreign exchange for coffee and maize. As compared to coffee, maize production becomes somewhat more favorable when the official exchange rate (ETB 2.07/1 USD), is used instead of the adjusted (or "shadow") exchange rate (ETB 3.5/1 USD). On the other hand, coffee production becomes somewhat more favorable relatively to maize when a shadow exchange rate, ETB 4.0/1 USD, is used. However, increasing the exchange rate from 3.5 to 4.0 or reducing it from 3.5 to 2.07 does not change the rankings of the two crops on either of the two basic profitability parameters.

Similarly, increasing maize prices by 25% or coffee prices by 25% does not change the rankings of the two crops. Thus, the results of the study are not very sensitive to changes in the exchange rate or to increases in prices of maize and coffee.

Table 7.4. Sensitivity analysis of the results of social profitability analysis in birr per hectare

Items	As reported in Table 7.3*	Assuming exchange rate per 1 USD		Assuming prices increase by 25%	
		ETB 2.07	ETB 4.00	Maize	Coffee
Coffee					
Net returns to land, labor, and management	2007.99	985	2365	2008	2518
Net returns to land, labor, and management per workday	8.53	4.2	10.0	8.5	10.7
Net returns to land and management	1452.14	430	1810	1452	1962
Maize					
Net returns to land, labor, and management	1425.00	788	1648	1865	1425
Net returns to land, labor, and management per workday	10.79	6.0	12.5	14.1	10.8
Net returns to land and management	1072.78	436	1296	1513	1073

* Assuming exchange rate of 3.5 ETB = 1 USD

8. CONCLUSION

Farmers evaluate returns to land and returns to labor since both factors are scarce in the survey area. The analysis of private profitability shows that maize is more profitable than coffee to farmers in terms of both returns to land and labor. In deciding which crop to grow and how to manage it, farmers take many factors into account other than profitability. The analysis shows that maize is superior to coffee on these criteria, maize production has less production uncertainty, is better for the farmers in ensuring food security, in providing more flexibility in management, and in being more complementary to livestock production. These factors, together with maize's higher profitability, account for the sharp decline in coffee production in recent years.

On the other hand, the analysis of social profitability shows that coffee is more profitable than maize from society's perspective. Returns to land, arguably Ethiopia's most scarce resource, are 40%

higher for coffee than for maize. Furthermore, coffee is a soil conserving crop whereas maize production promotes erosion. Since the survey area is very hilly and its soils are subject to erosion, the area is better-suited for coffee production.

The difference in the results of the analyses of private and social profitability are caused by policy biases against coffee production. These include the undervaluation of foreign exchange, taxes on coffee, and the restrictions on movement of maize into the survey area and on the marketing of coffee. In 1990, restrictions on the movement of maize were lifted but the impact of this policy change on maize prices is not yet known.

Policymakers need to take measures to bring incentives for farmers in line with societal objectives. The following measures are proposed to reverse the decline in coffee production in the survey area and, at the same time, stabilize the maize supply in the area.

Although the proposals are listed individually, they are inter-dependant. For example, there is widespread evidence from other countries that show that increasing crop prices does not necessarily lead to sustained increases in production. Rather, price increases must be accompanied by an array of agricultural support services including research, extension, credit, input supply, and marketing channels (Ghai and Smith 1987).

1. Devalue the Ethiopian birr and increase the coffee price paid to the farmers.

At the current official exchange rate of 2.07 ETB/1 USD the benefits of foreign exchange to the Ethiopian economy are greatly underestimated. Devaluation is a complex economic issue and is beyond the scope of this paper. The analysis shows that devaluing the Ethiopian birr can greatly increase coffee's profitability. Devaluing the birr from 2.07 ETB/1 USD to 3.50 ETB/1 USD increases coffee's net returns to land, labor, and management by over 100% (Table 7.4).

The recent announcement by the government to eliminate the export tax on coffee is beneficial. However, the claim that the government is subsidizing the coffee price (Ethiopian Herald 1989) rests on the assumption that the value of a dollar in foreign exchange is worth only 2.07 ETB. In fact, a dollar has a much higher value to the Ethiopian economy than is reflected in the official exchange rate.

Assuming a market-clearing[1] value of 3.50 ETB/1 USD, the analysis shows that the social price of coffee in the survey area is 4.71 ETB per kilogram of clean coffee; it is about 92% higher than the current price farmers receive (2.45 ETB/kg). The

[1] By market-clearing value, we mean the value at which supply would equal demand on the world market. At the current price of 2.07 ETB/1 USD, there is virtually no demand for the ETB because it is overvalued.

difference between these two represents a coffee tax to be paid by the farmers to the government. Thus, there is still much scope for increasing the farmgate price for coffee to reflect the real value of coffee to the Ethiopian economy.

2. Lift restrictions on grain movement into coffee-producing areas

Restrictions on the movement of grain into grain-deficit areas such as the Mana-Goma survey area have several deleterious effects. The restrictions affect (1) the coffee producers who have to pay higher prices for maize, their major staple food, (2) the grain producers from surplus areas who are unable to sell their grain in deficit areas, and (3) the nation since the policy encourages the farmers in the deficit areas to shift from coffee to maize which promotes soil erosion and is less profitable to society.

In September 1990, the Ethipian government announced that restrictions on grain movement would be lifted throughout the country (Ethiopian Herald 1990). If implemented, this measure should result in a decrease in maize prices in maize-deficit, coffee-producing areas. Maize price reductions, in turn, should increase the relative profitability of coffee.

3. Eliminate "campaign" labor and peasant association common holdings

Until 1990, the farmers were obliged to provide unpaid, "campaign" labor to PAs common holdings and PCs. They were also sometimes obliged to provide labor to state farms for which they were paid the minimum wage. All forms of coercive provision of labor should come to an end. PCs and state farms requiring labor should offer wage rates that allow them to obtain the labor they require on a voluntary basis. The policy decision to distribute PAs common holdings among farmers will go a long way towards solving this problem. These farms are grossly inefficient and the source of great ill-feeling among farmers towards the government's development efforts (Kassahun et al 1988). Since most PCs are also being dissolved, the demand for smallholders' labor on those farms will also fortunately be reduced.

4. Provide secure land tenure

In recent years, as the producer cooperatives and common holdings expanded, farmers lost their coffee farms or were reallocated new farms. Lack of secure land tenure prevents farmers from making long-term investments on their farms. Farmers should be given titles to their land; they will invest in their coffee farms only if they feel sure that they will be able to reap the benefits of their investments. The government's recent announcement that farmers will be permitted to own land in the future is encouraging.

5. Intensify smallholder focus of the Coffee Development Project

Until recently, the approach the Coffee Improvement Project (CIP) used in disseminating improved technology was an important constraint to coffee production. From the inception of the project in the 1970's until 1987, nearly all inputs and technical assistance were

reserved for PCs and PAs common holdings. Since 1987, CIP has been changing its focus, and increasing assistance to smallholders.

Farmers are discouraged from participating in CIP activities by two policies. First, farmers have to pay much more than PCs do for a given input. For example, farmers pay twice as much for coffee seedlings as do PCs. Second, some CIP extensionists insist that individual farmers follow all CIP recommendations, otherwise no assistance is offered. In some areas, farmers are permitted to plant improved CBD-resistant varieties only if they agree to clear a field for planting and follow methods prescribed by CIP; they are not allowed to plant the new varieties in their existing coffee farms. This approach is in marked contrast to the approach of the Ministry of Agriculture (MOA), that advises farmers on how to use improved inputs rather than requiring the farmers to use them in a specific way.

CIP should intensify its smallholder-based approach and emphasize advising farmers to adopt new inputs and techniques, as is practiced by MOA and other development organizations in Ethiopia. Farmers know their own needs and their environment best. They should be allowed to use improved inputs in the ways they see suitable.

6. Lift restrictions on coffee marketing

Farmers expressed strong concern in the survey over their inability to sell their coffee when, where, or to whom they wanted. Farmers should be permitted to decide whether to sell their coffee as cherry or *jenfel*, to store it for later sale if they prefer, and to transport it to other areas for sale. Policymakers can influence these decisions through changing incentives, especially prices, in order to ensure that farmers' decisions are in line with the criteria of social profitability. For example, if the social profitability of washed coffee is higher than that of unwashed coffee and there is unused capacity in pulping stations, policymakers can increase the price of red cherry to encourage farmers to deliver more red cherry to the pulping stations.

7. Replace the coffee land tax with a tax that does not discriminate among crops

Farmers pay a tax according to the amount of coffee they cultivate. However, this tax is a disincentive to coffee production. It should be eliminated or replaced by a tax with no biases among crops. For example, the tax could be based on the amount of land cultivated instead of on the area under coffee production.

8. Initiate an on-farm research program for coffee and maize

In on-farm research, researchers work together with farmers and extension staff to identify the principal constraints to production and develop solutions that are acceptable and feasible for farmers (Mulugetta et al. 1989). Emphasis should be given to coffee and maize since all farmers grow both crops and will continue to do so.

Researchers in coffee production should seek to improve smallholder production through introducing low-cost, simple technologies. In maize production, techniques for reducing soil erosion should receive high priority (Kassahun et al. 1988).

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Appendix 1

Coffee harvesting cost

Items	High-yielding year		Low-yielding year	
	Red cherry	*Jenfel*	Red cherry	*Jenfel*
Amount harvested (kg/workday)	22	11	11	5
Average wage rate per workday (birr)	2.33	2.00	2.00	1.50
Additional value for lunch	0.50	0.50	0.50	0.50
Total cost per workday (birr)	2.83	2.50	2.53	2.00
Harvesting cost birr per kilogram	0.13	0.23	0.23	0.40

Source: Survey interviews

Notes:

The above figures are averages of 24 interviews. A workday for picking red cherry usually takes 6 hours but has been converted in the analysis to 8 hours. The difference in the wage rate is due to the difference in the amount of cherry picked per workday.

In low-yielding years the quantity of *jenfel* collected per workday is less than in high-yielding years. This is because in the low- yielding years, coffee does not ripen uniformly and the harvesting period is longer than in the high-yielding year.

Appendix 2

Tool costs

The annual service cost of tools used in coffee production is calculated using the capital service cost method (Spencer et al. 1979):

$$C = \frac{rV}{1-(1+r)^{-n}}$$

C= annual service cost

r= interest rate (assumed in this analysis to be 20% per year)

V= Acquisition cost

n= Number of years of use

Annual service cost is calculated using the data in the following tables.

Table 1. Costs of tools in coffee production among smallholders per hectare per year

Tools	No./farm	Years service	% allocated to coffee	Price (birr)	Service cost
Slasher	1	3	90	20	8.55
Spade hoe	1	4	100	15	5.79
Sacks	5	3	100	5	11.87
Basket	5	1	100	1	6.00
Total					32.21

Table 2. Costs of tools in maize production among smallholders per hectare per year

Tools	No./farm	Years Service	% allocated to maize	Price (birr)	Service cost
Sickle	1	3	100	7	3.32
Slasher	1	3	10	20	9.49
Sacks	5	3	100	5	11.87
Plow	1	5	80	60	20.06
Total					44.75

Appendix 3

Data from studies on costs and returns of coffee and maize

Items	Enterprise study Mana-Goma	World Bank (1987) Kefa	ULG (1988) Kefa	ULG (1989) Kefa	Coffee Improvement Project (1986) Gimbi/Haru
Yield (kg/ha)					
Coffee (clean beans)	433	400	400	500	400
Maize	2700	1600	1200	2000	1500
Prices (birr/kg)					
Coffee	2.46	2.65	3.00	2.60	1.5
Maize	0.56	0.43	0.33	0.61	0.71
Gross revenue (birr/ha					
Coffee	1061	960	1200	1300	600
Maize	1512	688	386	1221	1500
Workday/ha					
Coffee	235	452	153	N.A	N.A
Maize	132	103.5	93	103	N.A
Earnings (birr/workday)					
Coffee	3.83	2.35	7.8	N.A	5.0
Maize	8.90	6.65	2.9	10.7	9.6
Labor use on maize					
Land preparation	24	N.A	N.A	16	20
Planting	13	N.A	N.A	2	2
Weeding	39	N.A	N.A	30	90
Harvesting	23	N.A	N.A	25	30
Transport/threshing	12	N.A	N.A	20	N.A
Labor use on coffee					
Weeding	75	N.A	N.A	N.A	
Hoeing	24	N.A	N.A	N.A	140
Picking (cherry)	74	N.A	N.A	170	100

N.A. = not available