MINISTRY OF AGRICULTURE OF MOZAMBIQUE

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THE ECONOMICS OF SMALLHOLDER HOUSEHOLDS IN TOBACCO AND COTTON GROWING AREAS OF THE ZAMBEZI VALLEY OF MOZAMBIQUE

by

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Carlos Mucavel
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1. INTRODUCTION

In the context of the study on the economy-wide impacts of agro-industrial investments and cash cropping in the Zambezi Valley of Mozambique, a survey was undertaken in the region. Data collection was implemented in two rounds in February/March and August/September 2004, to get information for the 2003/2004 agricultural season. The field work took place in select areas where cotton and tobacco firms operate contract farming schemes, and targeted a stratified sample of growers and non-growers of those crops. The survey was aimed at gathering information that was used to construct input-output tables for agricultural and nonagricultural production sectors in those areas to feed into the regional SAM (Social Accounting Matrix) used as the key data source for the regional CGE (Computable General Equilibrium) model to be used in policy analysis. Of particular interest was the collection of information on labor use patterns and the use of intermediate inputs in farming and non-farming activities in selected tobacco and cotton growing areas throughout the cropping cycle. In addition to that, the data collected covers a wealth of issues such as household demographics, land access and use, crop production and sales, livestock production, consumption and sales, household income diversification in non-farm activities, and flows of remittance income and pensions.

This paper is the first output generated with the data collected in that survey. It is a descriptive piece that focuses on identifying and presenting a snapshot of the rural economy in the Zambezi Valley cash cropping economies. It makes it by presenting key statistics on selected representative characteristics of rural households in both cotton and tobacco growing areas. For each of those areas, the tabular and graphical results are broken down into growers versus non-growers of those key cash crops. Although not analytical, the paper sheds light in a number of issues of concern in cash cropping economies in the region.

The study was undertaken by a team of researchers from the Bureau for the Promotion of Commercial Agriculture (GPSCA/Ministry of Agriculture), the Policy Analysis Department (DAP/Ministry of Agriculture), and Michigan State University (MSU). Field work was implemented using locally hired enumerators and substantial logistical support from the Provincial Department of Agriculture of Tete. The cotton (CNA - Companhia Nacional Algodoeira, and DUNAVANT - Mozambique) and tobacco (MLT - Mozambique Leaf Tobacco, and DIMON - Mozambique) companies also played a key role in helping the team with the organization of the work at the district level, and by providing some background information. Financial support was provided by the Italian Cooperation in Mozambique, through GPSCA, Michigan State University, and the Ministry of Agriculture of Mozambique.

This paper is structured as follows: section two introduces its objectives; section three details the methodology used in the data collection process; section four presents an overview of the cotton and tobacco sectors nationwide and puts the Zambezi Valley region in perspective; section five presents the statistical results on the analysis of representative characteristics of small farmers in cotton and tobacco areas, including a profitability analysis and the structure of rural smallholder income; and section six closes with a summary of conclusions.

2. OBJECTIVES

The Zambezi Valley economy has experienced significant growth in the recent past (Boughton 2004; Walker et al. 2004; and MPF/IFPRI/Purdue 2004). To keep pace with the rapid developments occurring in cotton and tobacco economies in the region and define policies aimed at creating an environment leading to its sustainable development, it is important to have a clear picture of the rural economy in that region and be able to follow its evolution over time.

Given the predominance of a smallholder-based economy, this paper is aimed at presenting a picture of the smallholder economy in cash cropping areas of the Zambezi Valley of Mozambique, where four firms operate contract farming schemes with smallholder farmers. The ultimate goal is to identify and present some key representative characteristics of those farming households engaged in or those not engaged in the contract farming schemes, in both the cotton and tobacco growing areas. Those statistics are just an initial snapshot that can be used for future monitoring of indicators and complement other consolidated databases to come out of this study. One example of such generated data bases is the regional Social Accounting Matrix (SAM) that records the key transactions in the regional economy and will be used for further economy-wide policy analysis.

The key representative characteristics presented in this paper include the following aspects:

- ❑ Statistics of cotton and tobacco smallholder operations;
- ❑ Demographic characteristics and income sources of smallholder farmers;
- ❑ Access to land, land use, and land allocation to crops;
- ❑ Use of animal traction and chemical inputs;
- ❑ Labor use patterns in smallholder farms for selected crops;
- ❑ Patterns of food crop production and sales;
- ❑ Ownership of production assets and purchases of investment goods;
- ❑ Ownership and marketing of livestock;
- ❑ Non-farming sources of income;
- ❑ Cutting and planting of trees by smallholder farmers;
- ❑ Smallholder Profitability; and
- ❑ Structure of Rural Smallholder Income.

3. RESEARCH METHODOLOGY

This section presents the methodology used for data collection in this study. In order to get the necessary reliable data to undertake the analysis contained in this report, a multivisit survey was undertaken in the study region. Undertaking two visits allowed for more precision in the data collected on the levels of input use and the variation in factor use, particularly the seasonality in labor demand and the household decision with respect to the use of family labor or hired labor and its allocation across competing activities. The precise schedule for the field work data collection was driven by the crop calendar of the crops of interest. The following sections present the details on the sampling strategy and coverage, and the contents of the survey instrument.

3.1. Sampling Strategy and Coverage

The study followed a stratified random sample procedure. It covered concession areas for four firms operating contract farming schemes in the Zambezi Valley. Two of those were the only two tobacco firms operating in Tete Province (Mozambique Leaf Tobacco, and DIMON-Mozambique). The other two were cotton companies, one operating in Tete Province (DUNAVANT-Mozambique) and the other operating in Northern Sofala Province (CNA).[1]

The survey targeted 300 smallholder farmers in the region to be interviewed in two rounds, each one covering 6 months of the 2003/2004 agricultural season. In tobacco areas the targeted sample was 180 farmers among growers (144) and non-growers (36). One hundred of those farmers were drawn from the Mozambique Leaf Tobacco Area (80 growers and 20 non-growers), and 80 were from the DIMON–Mozambique area (64 growers and 16 non-growers). In cotton areas 120 farmers were targeted. Among those there were 96 growers and 24 non-growers. Sixty of those farmers were drawn from the DUNAVANT–Mozambique Area (48 growers and 12 non-growers), and the other 60 were from the CNA area (48 growers and 12 non-growers).

The households were first interviewed in March 2004 to collect data on field and economic activities for the period September 2003–February 2004. For the majority of the crops that period covers pre-harvesting activities. The second round was undertaken in September 2004 to collect data for the remainder of the period that, for many crops, included harvesting and post-harvesting activities. Although tobacco harvesting started around February/March, we did the collection of labor use and marketing data for the harvesting and marketing in the second round. For details on the cropping calendars for the two major crops (cotton and tobacco), see Annex 1 at the end of this report.

[1] There are three cotton Companies operating in the study region (CNA, COTTCO Mozambique, and DUNAVANT Mozambique). The field data collection did, however, only focus on those two. DUNAVANT has operated with great success in the Eastern Province of Zambia, and has just got established in Mozambique. It is currently facing challenges associated with the characteristics of the Mozambique system, but has a long term perspective, and hopes to pick up and reach the levels attained in Zambia through intensification and its management style based on a one-to-one relationship with a network of distributors paid on a performance basis. CNA engages in a very intensive production system and is currently one of the best performers in the sector in terms of yield. Given its experience in Zimbabwe and the commitment demonstrated in Mozambique, COTTCO (Mozambique) will eventually show very similar patterns as CNA. On the basis of that, and the fact that it has only started its operations in recent years, we chose not to pick it for field work.

As it normally occurs in multiround surveys, sample attrition causes reduction in the sample in rounds following the first. Overall, we got a sample attrition rate of 5.3%.[2] It was higher in tobacco areas, about 7.2%, as compared to 2.5% in cotton growing areas. Table 1 shows the sample sizes for both rounds of the survey in cotton as well as in Tobacco areas. The sample attrition rates are shown in the last column for each target area.

Table 1. Zambezi Valley Study Survey Sample

		First Round of Survey			Second Round of Survey			Sample Attrition Rate
TOBACCO AREAS		— Number of Farmers —			— Number of Farmers —			
Firms	Districts	Growers	Non-growers	Total	Growers	Non-growers	Total	(%)
MLT	Marávia	16	4	20	15	3	18	10
	Macanga	32	8	40	30	7	37	7.5
	Angonia	32	8	40	31	6	37	7.5
	Total	80	20	100	76	16	92	8
DIMON	Chifunde	64	16	80	61	14	75	6.3
All Tobacco Areas		144	36	180	137	30	167	7.2
COTTON AREAS		— Number of Farmers —			— Number of Farmers —			
Firms	Districts	Growers	Non-growers	Total	Growers	Non-growers	Total	(%)
Dunavant	Chifunde	16	4	20	16	4	20	0
	Chiúta	16	4	20	15	4	19	5
	Moatize	16	4	20	16	4	20	0
	Total	48	12	60	47	12	59	1.7
CNA	Gorongosa	16	4	20	16	4	20	0
	Maringue	16	4	20	15	4	19	5
	Caia	16	4	20	15	4	19	5
	Total	48	12	60	46	12	58	3.3
All Cotton Areas		96	24	120	93	24	117	2.5
ALL SAMPLE		240	60	300	230	54	284	5.3

Source: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

[2] In panel data studies, where the same households are visited multiple times, the sample attrition rate refers to the proportion of households that are not re-interviewed for a variety of reasons.

In order to ensure appropriate statistical treatment to the data collected when generating the results, we developed sampling weights derived from the sample selection probabilities resulting from the sampling strategy and available population data. Those weights are activated in the generation of all results in this paper.

3.2. Contents of the Survey Questionnaire

The objective of the survey was to get basic household level data on the use of intermediary inputs and factors, and production and sales data for the major agricultural and nonagricultural activities undertaken in the selected region. This included the relevant cash crops (cotton and tobacco), other agricultural production sectors, and selected non-farm activities, as well as details on other sources of income, asset ownership and investments. Multilevel survey questionnaire design techniques were applied to allow for appropriate treatment of the data collected in the various parts of the survey. Excepting for minor differences, the survey instrument used in both rounds was very similar, but in each case applied for specific recall periods. The following is a list of topics included in the survey instrument:

- ☐ Smallholder household demographics;
- ☐ Land use and cropping patterns;
- ☐ Use and sources of farm non-labor inputs;
- ☐ Labor allocation (family and hired – permanent and temporary) in farm and non-farm activities;
- ☐ Production and marketing of crops;
- ☐ Ownership of production and marketing assets;
- ☐ Ownership and marketing of livestock;
- ☐ Income diversification – Micro and small enterprises and wage labor;
- ☐ Remittances from (and to) rural smallholder households;
- ☐ Pensions and other transfers;
- ☐ Uses of cash crop revenues: Production and marketing assets and business startups; and
- ☐ Smoking habits in rural smallholder households.

The survey questionnaires and electronic data sets are available at request.

4. STATISTICAL OVERVIEW OF THE TOBACCO AND COTTON SECTORS IN MOZAMBIQUE

This section presents a statistical overview of the tobacco and cotton sectors in Mozambique. It starts by looking at the national production trends over the past decade. Then it looks at selected variables, such as number of producers, area cultivated, and production and yields for the 2003/2004 agricultural season by firm and by location. With these data the study region is put into perspective.

4.1. Tobacco Sector

Tobacco production in Mozambique has grown very rapidly over the past seven years. From 1,500 tons in the 1996/7 agricultural season, national production of raw tobacco has increased every year to reach over 50,000 tons in 2003/4 (Figure 1). Over the same period the estimated number of tobacco growing households has increased from 6,000 to more than 120,000. There are currently five major firms (or partnerships) operating in the country promoting both smallholder contract farming schemes and larger scale commercial operations. The Firms/Partnerships operating in the country and the provinces where they operate are as follows: MLT – Mozambique Leaf Tobacco (Tete and Manica); JFS – João Ferreira dos Santos (Manica, Nampula, Cabo Delgado, Niassa, and Gaza); DIMON (Tete, Manica, and Sofala); Stancom/Mosagrius (Niassa); and Stancom/Sonil (Nampula). The impact of this rapid expansion of the tobacco sector on rural smallholder household incomes and economic growth has been dramatic (Walker et al. 2004; Donovan 2004; Boughton 2004; Benfica et al. 2004).

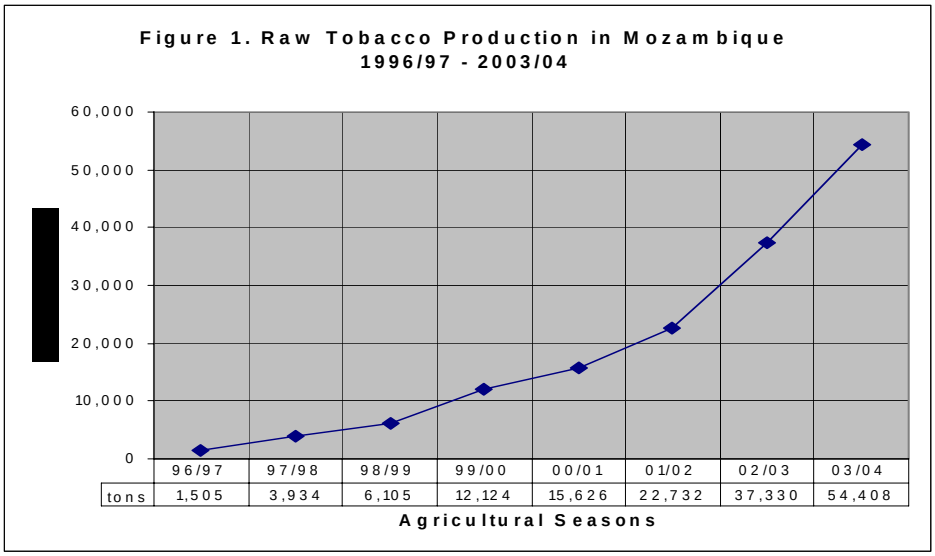
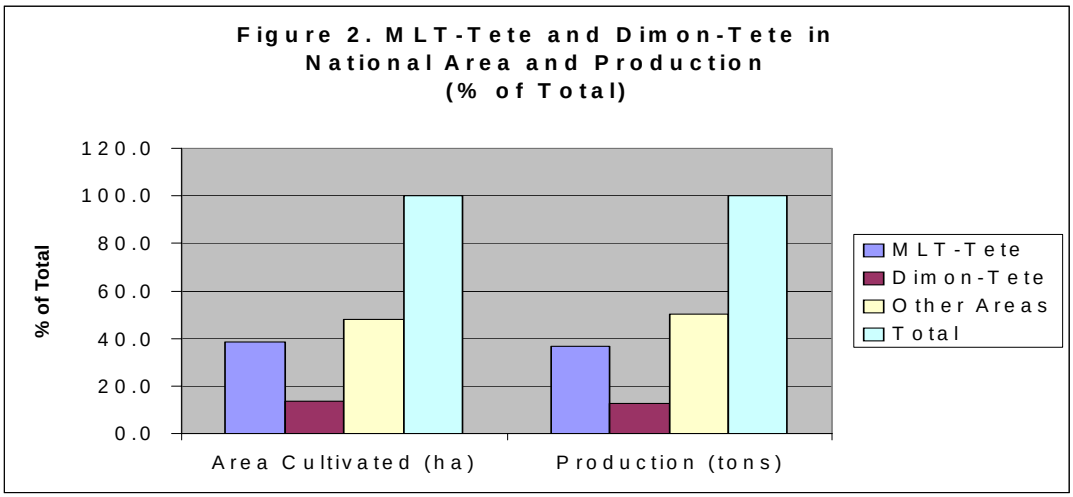


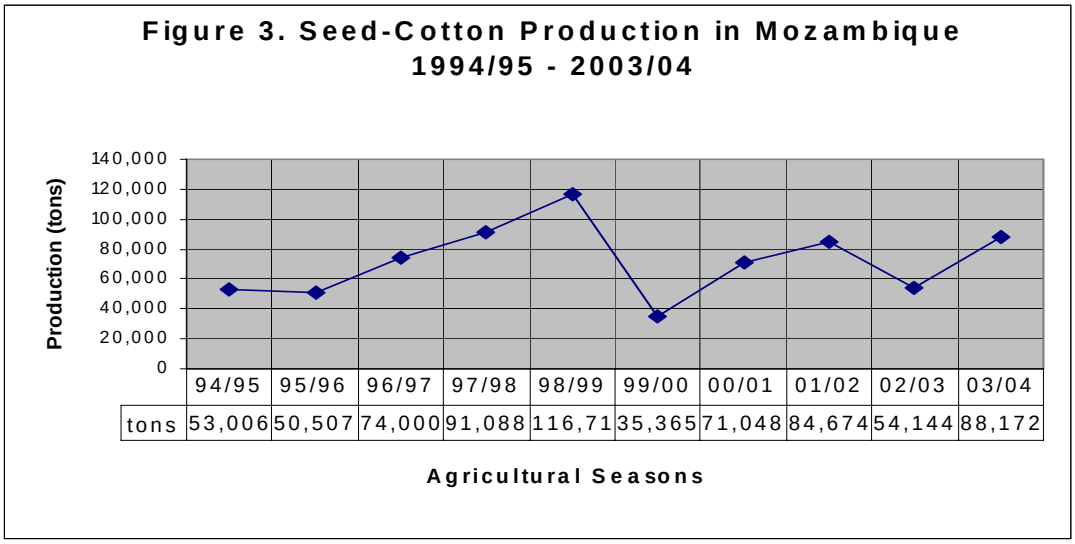
Table 2 presents key tobacco sector statistics for the agricultural season 2003/2004. Overall, there were 62,315 hectares of land planted with tobacco in eight provinces of the country by those firms. That area includes both commercial farming by large growers as well as smallholder growers involved in contract farming schemes. Total production in that season reached 54,408 tons of raw tobacco (about three quarters of that tobacco is of the burley type) and the total number of growers is estimated at over 120,000.

Table 2. Key Statistics of the Tobacco Sector in Mozambique, 2003-2004

Province/Firms	Area Planted		Production		Yield
	Area (ha)	%	Production (tons)	%	(tons/ha)
Niassa	8,977	14.4	7,692	14.1	0.86
JFS	6,812	10.9	5,332	9.8	0.78
Stancom	2,165	3.5	2,360	4.3	1.09
Cabo Delgado	82	0.1	82	0.2	1.00
JFS	82	0.1	82	0.2	1.00
Nampula	5,985	9.6	3,625	6.7	0.61
JFS	2,698	4.3	1,810	3.3	0.67
Stancom	3,287	5.3	1,815	3.3	0.55
Zambézia	3,991	6.4	2,391	4.4	0.60
JFS	3,317	5.3	1,976	3.6	0.60
Stancom	674	1.1	415	0.8	0.62
Tete	32,381	52.0	27,032	49.7	0.84
MLT	23,849	38.3	20,000	36.8	0.84
DIMON	8,532	13.7	7,032	12.9	0.82
Manica	10,359	16.6	13,214	24.3	1.28
JFS	188	0.3	129	0.2	0.69
MLT	1,439	2.3	2,920	5.4	2.03
DIMON	3,552	5.7	3,558	6.5	1.00
Stancom	5,180	8.3	6,607	12.1	1.28
Sofala	510	0.8	360	0.7	0.71
DIMON	510	0.8	360	0.7	0.71
Gaza	30	0.0	12	0.0	0.40
JFS	30	0.0	12	0.0	0.40
Total	62,315	100.0	54,408	100.0	0.87
JFS	13,127	21.1	9,341	17.2	0.71
MLT	25,288	40.6	22,920	42.1	0.91
DIMON	12,594	20.2	10,950	20.1	0.87
Stancom	11,306	18.1	11,197	20.6	0.99

Notes: The total number of growers in the country is estimated at about 120,000. From those 44,783 work in Tete Province alone (MLT: 34,038 and Dimon–Mozambique: 10,745). Due to the absence of precise data for most of the firms, data on the number of producers is not detailed in the table.
Source: DINA–MADER, and Individual Firms.





About 52.0% of the total area planted and 49.7% of the total production was by smallholder growers in Tete Province. Those farmers were engaged in contract farming schemes with Mozambique Leaf Tobacco (MLT), i.e., 36.8% of the national production by 34,038 farmers, and DIMON–Mozambique, i.e., 12.9% of the national production by 10,745 farmers.[3] See percentage distributions of production in Figure 2.

4.2. Cotton Sector

Cotton production in Mozambique has been floating up and down over the years. The historical high (144,061 tons) achieved over 20 years ago is far of being achieved. Current production represents 61.2% of that level. That is due to factors associated with unstable prices and demand conditions in the world market, as well as domestic issues related to the organization and performance of the contract farming arrangements between ginning/exporting firms and smallholder farmers, under which virtually all the production in generated. The production level of 88,172 tons achieved in 2003/2004 still falls short of the ten-year high achieved in 1998/99 (Figure 3).

[3] Note that if we account for the production those two firms get from their global operations in the country, their production share is much higher: MLT (42.1%) and Dimon–Mozambique (20.1%).

Table 3 indicates that out of a total cultivated area of 174,157 hectares, and an estimated production of 88,173 tons, Nampula Province accounts for about 43.4% and 38.7% respectively. In terms of individual firms, Plexus (Cabo Delgado) accounts for 18% of the area cultivated and 20% of total production. CNA appears with the second largest production volume, about 16% of national production, in spite of only cultivating about 9% of the area cultivated nationally. That is due to its high yield (0.82 tons/ha), that is significantly well above the national average of 0.52 tons/ha in 2003/04.

Unlike in the tobacco case, cotton production in the study area does not represent a significant share of national production. Indeed, with the exception on CNA, the other two companies (DUNAVANT–Mozambique and COTTCO/Algodão do Zambeze) did start their operations in the area within the past three years. All together, the firms in the survey area (DUNAVANT/Tete and CNA/Northern Sofala) accounts for only 18,164 hectares, about 10.45% of the national area cultivated with cotton, and 14,167 tons, approximately 16.07% of the national production in 2003/2004 (Figure 4).

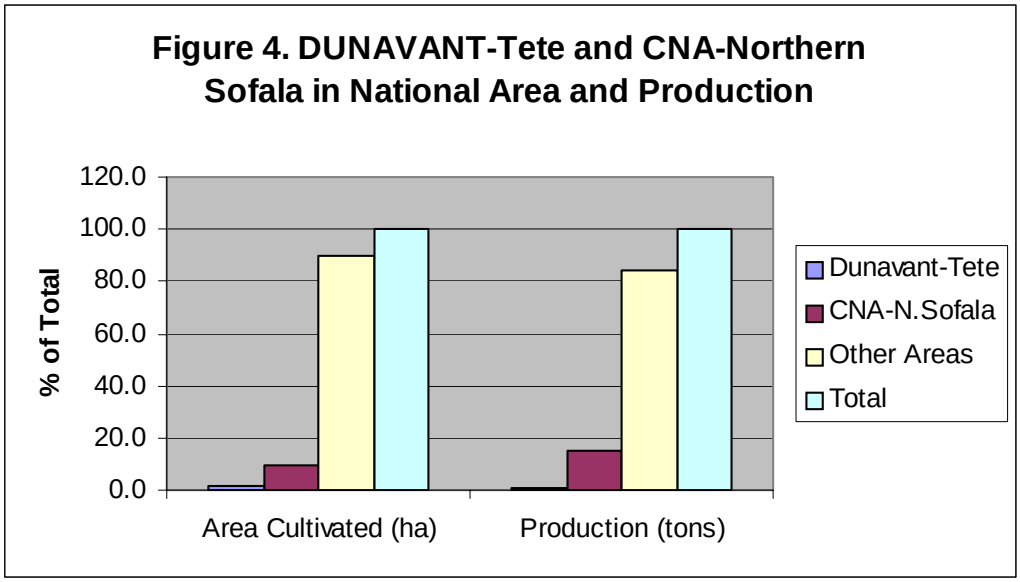


Table 3. Key Statistics of the Cotton Sector in Mozambique, 2003-2004

Province/Firms	Growers		Area Planted		Production		Yield (tons/ha)
	Number of Growers	%	Area (ha)	%	Production (tons)	%	
Niassa	-		14,863	8.53	7,817	8.87	0.53
SAN/JFS	-		14,863	8.53	7,817	8.87	0.53
Cabo Delgado	41,671		3,8958	22.37	20,819	23.61	0.53
PLEXUS	32,691		31,312	17.98	17,485	19.83	0.53
SODAN	8,764		7,547	4.33	3,290	3.73	0.45
MOCOTEX	215		89	0.05	25	0.03	0.28
Autonomous	1		10	0.01	19	0.02	1.90
Nampula	24,759		75,606	43.41	34,144	38.72	0.45
SODAN	24,223		17,883	10.27	7,254	8.23	0.41
SANAM	-		31,047	17.83	11,137	12.63	0.36
CANAM	-		20,460	11.75	10,774	12.22	0.53
SAN//JFS	-		4,060	2.33	3,391	3.85	0.84
IAM/MEMBA	470		400	0.23	48	0.05	0.12
Autonomous	66		1,756	1.01	1,540	1.75	0.88
Zambézia	9,918		13,957	8.01	3,940	4.47	0.28
AGRIMO	9,918		5,807	3.33	2,931	3.32	0.50
MOCOTEX	-		2,650	1.52	402	0.46	0.15
SAAM	-		5,500	3.16	607	0.69	0.11
Tete	7,430			4.23	4,256	4.83	0.58
DUNAVANT	4,022		2,257	1.30	1,037	1.18	0.46
AGRIMO	3,408		2,627	1.51	1,839	2.09	0.70
COTTCO	-		2,477	1.42	1,380	1.57	0.56
Manica	1,685			4.29	4,067	4.61	0.54
CNA	1,685		1,194	0.69	885	1.00	0.74
COTTCO	-		6,281	3.61	3,182	3.61	0.51
Sofala	22,382		15,937	9.15	13,130	14.89	0.82
CNA	22,382		15,937	9.15	13,130	14.89	0.82
Total	107,845		174,157	100.00	88,173	100.00	0.51
SAN/JFS	0		18,923	10.87	11208	12.71	0.59
PLEXUS	32,691		31,312	17.98	17,485	19.83	0.56
SODAN	32,987		25,430	14.60	10,544	11.96	0.41
MOCOTEX	215		2,739	1.57	427	0.48	0.16
SANAM	0		31,047	17.83	11137	12.63	0.36
CANAM	0		20,460	11.75	10774	12.22	0.53
IAM/MEMBA	470		400	0.23	48	0.05	0.12
AGRIMO	13,326		8,434	4.84	4,770	5.41	0.57
SAAM	0		5,500	3.16	607	0.69	0.11
DUNAVANT	4,022		2,257	1.30	1,037	1.18	0.46
COTTCO	0		8,758	5.03	4562	5.17	0.52
CNA	24,067		17,131	9.84	14,015	15.89	0.82
Autonomous	67		1,766	1.01	1559	1.77	0.88

Source: IAM and Individual Firms.

5. REPRESENTATIVE CHARACTERISTICS OF SMALLHOLDER HOUSEHOLDS: A STATISTICAL OVERVIEW

This sections presents an in-depth presentation of rural smallholder representative characteristics in the Zambezi Valley region of Mozambique. It selects a set of indicators that are used to illustrate how the rural economy looks like at this point. It includes issues like household demographics, patterns of use of productive resources, such as land, labor, capital (physical and livestock), crop production and marketing, off-farm income sources, deforestation and reforestation, among others. It also touches issues on farm level profitability and total household income structure.. As previously indicated, all the analysis in this section breaks down the sample in growers and non-growers, in both cotton and tobacco survey areas.

5.1. Household Demographics and Income Sources

5.1.1. Household Demographics

The selected demographic characteristics, presented in Table 4, include household size, percentage of female headed households, age structure of the population, dependency ratio, education of adult members, as well as school attendance rates among school aged children.

Table 4. Demographic Characteristics of Smallholder Households

Selected Characteristics	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Household Size - number of members	6	5.6	5.9	5.6
Female Headed - % of Households	4.2	15.6	5.4	9.4
Age Structure - % of people				
9 or less years	30.7	26.8	30.6	31.3
10 – 19 years	29.1	27.3	23.4	21.3
20 – 29 years	17.3	19.7	10.6	23.8
30 – 39 years	10.7	13.2	14.3	9.5
40 – 49 years	7.4	9.5	10.1	8.3
50 – 59 years	2.8	1.9	7.5	2.0
60 or more years	1.8	1.4	3.5	2.2
Dependency Ratio [1]	1.1	1	1.2	1.1
Education				
More than Grade 5 - % of HH heads	28.5	25.0	11.1	25.0
More than Grade 5 - % of all adults in the HH	18.7	25.1	14.3	17.7
School Attendance				
Children in School (%) [2]	59.5	69.4	64.2	74.7
Missed School (%) [3]	40.0	26.9	45.7	37.8

[1] Ratio of number of number of children (under 15) and elderly (over 60) to total number of adults in the household (aged 15 to 59).
[2] Among children aged 6 to 15 years in all households.
[3] Proportion of Households who had children missing at least 3 days of school in the past month in the beginning of the harvesting season (February), among those households with children in school.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Average smallholder household size range from 5.6 members among non-growers of cotton and tobacco, to 6.0 members among tobacco growers. Although the differences are not greatly accentuated, results indicate that growers tend to have larger households in both tobacco and cotton areas. This may be an indication that labor endowments are an important factor in smallholder decisions to engage in cash crops.

As expected, the incidence of female headed households is relatively low among smallholder households. When comparing growers to non-growers, results show that the incidence is much lower among cash crop growers. That is especially strong in tobacco growing areas where only 4.2% of grower smallholder households are female headed, against 15.6% among non-growers. In cotton growing areas, 5.4% of grower households are female headed and 9.4% among non-growers are female headed. These statistics may be an indication that female headed households, especially in tobacco growing areas, are not reaping the benefits of the cash cropping boom of recent years. In fact, one may argue that other characteristics associated to those particular households, such as size, access to productive resources, etc, may be behind their relatively lower participation in cash cropping in the study region.

The age structure of smallholder households in the study region is characteristic of a developing economy. In all areas, over 50% of the population is less that 20 years of age and less than 12% is over 50 years of age. Across the board, over 65% is over 10 and less than 60 years of age. This means that the number of potentially active people is considerably high in the area. Although the differences are not that accentuated, the dependency ratio – ratio of the number of children (aged under 15) and elderly people (aged over 60) to total number of adults (aged 15–59) – is slightly higher among cash cropping households.

We use two indicators regarding education. The proportion of household heads that completed grade 5, and the proportion of adult members (including the heads) that completed that same level of education. In tobacco growing areas, results indicate that the proportion of heads with grade 5 or over is greater among tobacco growers (28%) than among non-growers (25%), but when the entire family is accounted for, the adults in nongrowing households tend to be more educated. In cotton growing areas, the incidence of more educated people is more accentuated among non-growers. Any attempted inference from these results should be looked at with caution, since, in general, only less than a quarter of the rural adults have such education level and many other factors play a role both in the selection or self selection of cash crop growers as well as in their performance.

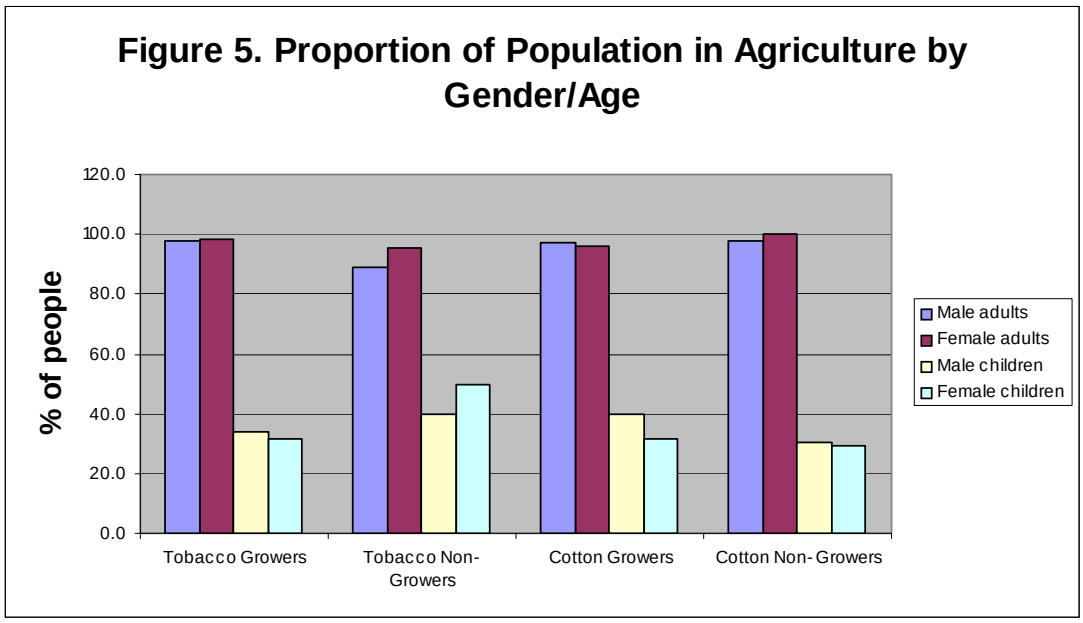
It is normally speculated and widely discussed in many policy circles that cash cropping has a negative impact on children demand for school and current school attendance. To have an initial comparative assessment of that issue, we created two indicators: The proportion of children aged 6–15 years in the sample that do currently attend school, and the proportion of households (among those with children in school) that have at least one child missing three or more days of school at the beginning of the harvesting season. Regarding the first indicator, several results emerge. First, the proportion of children in school is higher in cotton areas than in tobacco areas when similar groups are compared, i.e., 64.2% to 59% among growers, and 74.7% to 69.4% among non-growers. Second, in both tobacco and cotton growing areas, the proportion of children in school is about 10% higher among non-growers when compared to grower households. It is worth noting that in many of the study areas the availability of schools is rather scarce. Children have to travel long distances, and in many cases the highest level available is grade 5, which means that a

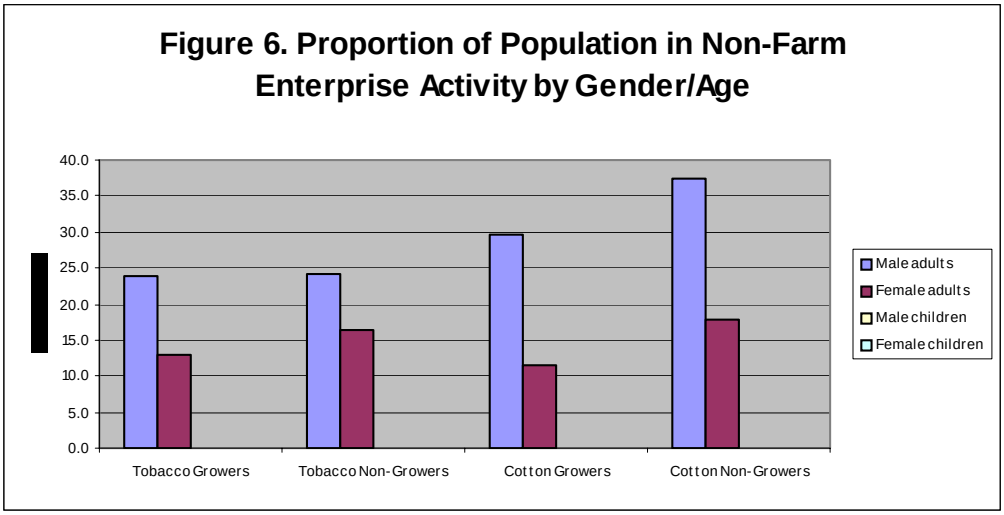
number of the older children in the age group considered here may have already completed that grade. With respect to school attendance, cash cropping households, in both tobacco and cotton areas, are more likely to have children missing school. Again, this is not an exhaustive analysis and just covers a short period, but it gives an initial indication that indeed attention needs to be paid to the issue.

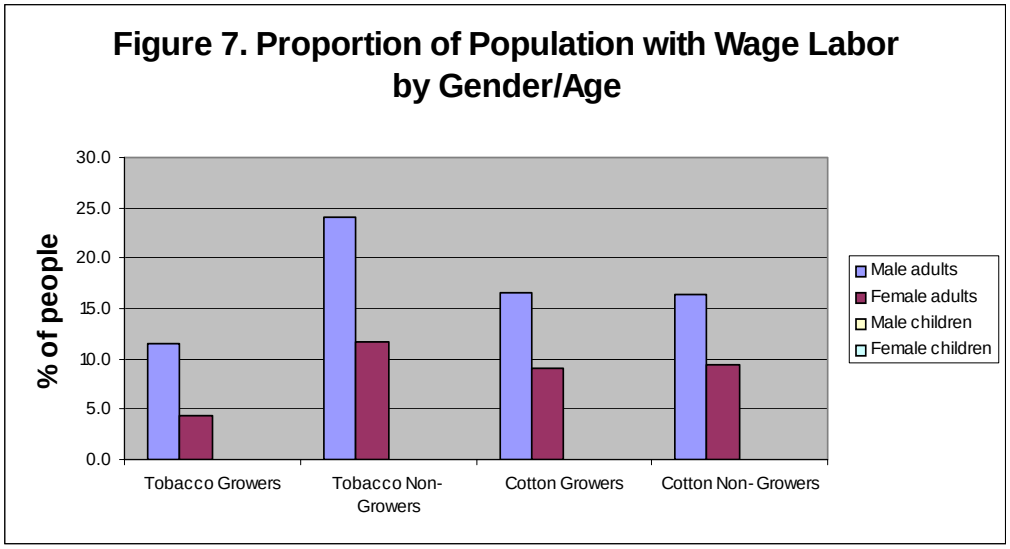
5.1.2. Income Sources of Smallholder Households

Smallholder households in the Zambezi Valley derive their income from various sources. We identify such sources and present information on the proportion of smallholder households that have at least one member, and then members of specified age and gender categories engaged in different economic activities (agriculture, non-farm enterprises, and wage labor). We also identify the proportion of households drawing income from pensions, as well as remittance income in-kind and in cash. The results are presented in Table 5. In Figures 5 through 7, we present the proportion of the sampled population (by gender/age) engaged in each of those economic activities by type of household and gender/age.

All sampled households get engaged (have at least one member) in some kind of agricultural production activity, using predominantly adult family members. In tobacco growing areas (among growers and non-growers) and among cotton growers, over one third of the smallholder households did use children aged 15 years or less for agricultural activities. Figure 5 indicates that over 90% of the adult population, both male and female, are engaged in agricultural production. The proportion of family children engaged in agricultural activities is more common among non-growers of tobacco than among growers (over 40% vs. just about 30%). Among those non-growers, the incidence of family female children is slightly higher than the male children. In cotton areas, the use of family children is just slightly less likely among non-growers.







Non-farm enterprises are an important source of income for rural households in Mozambique. Benfica et al. (1997) and Benfica (1998) find that those are predominantly processing and trading activities with strong linkages to agriculture. Results in Table 4 indicate that about 46.9% of tobacco growing households run at least one of these businesses. The proportion is 45.2% among non-growers of tobacco. In cotton areas, non-growers are more likely than growers to run a small non-farm businesses (56.2% to 47.9%). It should be noted that in all cases, non-farm businesses are more common among male adults than among female adults. According to the results, there are no children owning those types of enterprises in the study area. Additional analysis also indicates that the use of children as family workers in this type of businesses is not common. In later sections, we look a bit more on the structure of the non-farm sector.

Table 5. Economic Activity and Income Sources

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
	---------- % of smallholders with ... ----------			
Agricultural Activities				
Any Person	100.0	100.0	100.0	100.0
Male Adults [1]	98.2	93.5	98.1	96.9
Female Adults [2]	98.0	93.5	96.7	100.0
Male Children	36.0	48.4	41.3	23.4
Female Children	36.7	34.5	38.2	29.7
Micro-Enterprise				
Any Person	46.9	45.2	47.9	56.2
Male Adults [1]	37.9	32.3	42.0	45.3
Female Adults [2]	18.2	22.6	16.3	21.9
Female Children	0.0	0.0	0.0	0.0
Male Children	0.0	0.0	0.0	0.0
Wage Labor				
Any Person	18.7	45.2	28.2	26.5
Male Adults [1]	16.9	38.7	23.0	23.4
Female Adults [2]	5.5	16.1	11.6	14.1
Female Children	0.0	0.0	0.0	0.0
Male Children	0.0	0.0	0.0	0.0
Other Sources				
Remittance Income - Received Cash	13.9	9.4	15.4	10.9
Remittance Income - Received In-Kind	14.7	25.0	27.1	37.5
Remittance Income - Sent Cash		28.1	36.5	28.1
Remittance Income - Sent In-kind	37.9	53.1	60.2	46.9
	48.8			
Pensions/other Sources	4.8	10.7	13.9	7.8

[1] Males 15 years or older.
[2] Females 15 years or older.
Note: The assessment on the incidence of wage labor and micro-enterprises takes data from the first part of the season, when planting decisions were made . A more detailed analysis for the entire period is presented later in this report.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

An alternative source of income for rural households is wage labor. This includes remuneration obtained through work in other household farms, small businesses run by other households, and other employment obtained in economic activities both in private firms, nongovernmental organizations, and in the public sector. Table 5 shows that while all kinds of smallholders draw income from this source, it is much more common among non-growers of tobacco in tobacco areas. This suggests the existence of strong labor market linkages in tobacco growing areas. Wage employment opportunities taken are more common among male adults than among females (Figure 7). This results show that while the use of children for agricultural activities is common practice within the households, hiring child labor is not evident. Later in this report, in section 5.8.2., a more detailed analysis is made of the sectoral structure and other issues related to wage labor income opportunities.

Depending on its particular economic circumstances, rural households may receive or send *remittances* to other households outside their area of residency. Those remittances may take the form of money or in-kind payments (food or nonfood items). Results indicate that in tobacco areas 13.9% of the grower households received some form of cash remittances against only 9.4% among non-growers. When it comes to cash in-kind remittances received, a higher proportion of nongrower did get some (25%) against only 14.7% among growers. The patterns are essentially similar in cotton areas, but the proportion of households getting remittances of each kind are always higher than in tobacco growing areas. In table 5, we also present the proportion of households sending remittances. While in cotton areas grower households are more likely to send both types of remittances (cash and in-kind), in tobacco growing areas grower households are predominantly engaged in sending cash and non-growers are comparatively more likely to send in-kind remittances. The proportion of households receiving *pensions* (especially retired military personnel) is relatively small, ranging from 4.8% among tobacco growers to 13.9% among cotton growers.

5.2. Land Use and Cropping Patterns

Along with labor, land is one of the key factors of production in the Mozambican smallholder agriculture. Although the country is relatively land abundant, assess to land is constrained in some areas, and its availability conditions the ability smallholders have to respond to market incentives. Previous studies (Tschirley and Weber 1994; Marrule 1998; Jayne et al. 2003) have indicated that land area cultivated by smallholders is an important determinant of differentials in household incomes per capita in a number of African countries, including Mozambique.

In this section, we look at some statistics related to the use and access to land as well as to the cropping patterns of smallholder households associated with land use in the study area. Results are presented in Tables 6 and 7.

Smallholder households were asked about how they got access to each plot of land they are currently using. In all areas the most common way of accessing to land is through free occupation. That normally happens with households in an area where they are already established and expansion takes place naturally. The second most common way varies according to the type of smallholder. For example, among tobacco growers, a third of the farmers report obtaining land through the traditional authorities and just a tiny fraction through the formal authorities. In reality, this reflects the fact that some of the people newly engaged in tobacco migrate from many parts of the province and the mechanism to obtain land is through the traditional authorities. Among non-growers in those areas, inheritance is the second most important way. In cotton growing areas, access through the traditional authorities is also important but other unspecified ways appear to be also important.

As expected, reported land purchases and renting is not common. Even in tobacco growing areas where the value of land is assumed high and demand is increasing in recent years, only 2% report renting part of the land they use, and 0.6% report buying it. It is possible that these rates are high. However, since land is officially owned by the state, respondents are reluctant to openly report on such transactions. In cotton areas no rental or purchasing transactions are reported among growers. Surprisingly, 4.7% of the non-growers in those areas report renting and 7.8% report buying.

Table 6. Land Area Cultivated, Type of Access, and Land Renting/Purchasing

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Area Cultivated				
Number of Fields	2.9	1.7	2.8	1.9
Mean Area per Field (ha)	2.3	3.2	1.4	1.5
Mean Total Area per smallholder (ha)	6.6	4.7	3.9	2.7
Type of Access to Land	---------- % of smallholder households ----------			
Traditional authorities	31.6	15.6	15.8	15.6
Formal authorities	2.3	3.1	1.2	4.7
Occupied	44.1	37.5	74.8	57.8
Inherited	13.6	28.1	6.4	7.8
Others	22.6	21.9	18.2	29.7
Land Renting/Purchasing	---------- % of smallholder households ----------			
Farmers that report renting in	2.0	0.0	0.0	4.7
Farmers that report purchasing	0.6	0.0	0.0	7.8

Notes: The average number of tobacco fields among growers is 1.2 and the mean area with tobacco per grower is 3.1 ha. In cotton, the figures are 1.0 fields and 1.4 ha.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

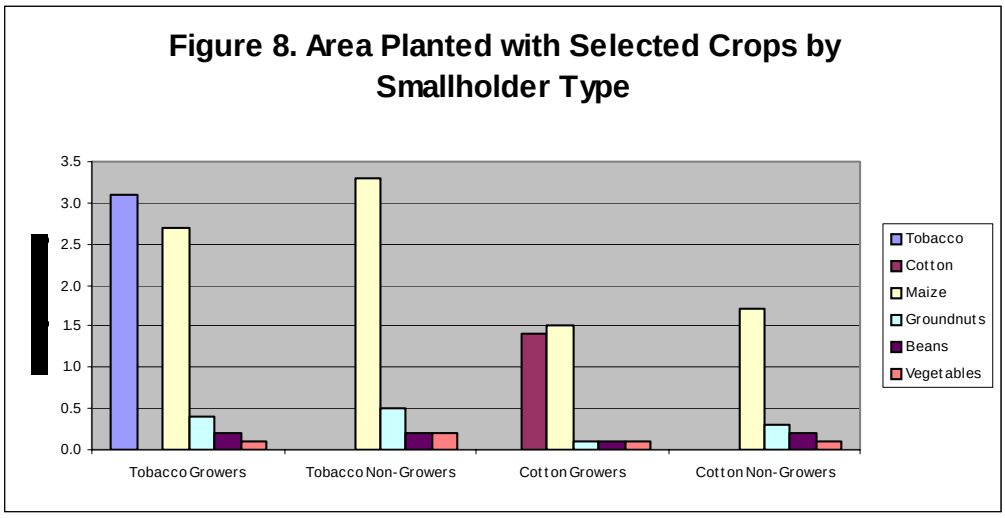
Results in the top part of Table 6 show that growers in both tobacco and cotton areas tend to have more fields planted than non-growers – 2.9 versus 1.7 fields in tobacco areas, and 2.8 versus 1.9 fields in cotton areas. Field sizes are larger among non-growers in both areas. Note that, in general, fields are larger in tobacco growing areas. The total area cultivated by farmers is greater among growers in both areas. In general it is by far greater in tobacco growing areas, where growers have an average total area of 6.6 hectares and non-growers have 4.7 hectares, than in cotton growing areas, where an average grower has 3.9 hectares and a nongrower has only 2.7 hectares.

It is important to keep in mind that that these total areas are a reflection of the fact that each of these types of farmers grows a combination of crops. To have a better idea about that, Table 7 presents the percentage of farmers growing major crops and the average areas occupied with those crops. It becomes clear, from Table 7 and Figure 8, that in all areas maize is an important crop. Besides being grown by virtually all farmers, it takes a great deal of area. Among growers in tobacco growing areas, the area planted with tobacco is approximately 3.1 hectares against an estimated 2.7 hectares with maize. Non-growers have maize areas of 3.3 hectares, i.e., greater than that of tobacco farmers. In cotton areas, the area planted with maize (1.5 ha) among cotton growers is slightly higher than that planted with cotton (1.4 ha). Mean area with maize among non-growers is even higher (1.7 ha). It should be noted that maize is very important as a food security crop, but also as a means of payment for temporary and permanent labor, particularly in tobacco fields. It is also a marketed crop for a number of households. The importance of the other crops in terms of area planted is marginal, but they are generally grown by about half of the population.

Table 7. Prevalence of Selected Crops and Mean Area Cultivated

Selected Crops	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Tobacco				
% of farmers	100.0	0.0	0.0	0.0
Mean Number of Fields	1.2	-	-	-
Mean Total Area per grower (ha)	3.1	-	-	-
Cotton				
% of farmers	0.0	0.0	100.0	0.0
Mean Number of Fields	-	-	1.0	-
Mean Total Area per grower (ha)	-	-	1.4	-
Maize				
% of farmers	99.2	100.0	96.7	100.0
Mean Number of Fields	1.2	1.3	1.1	1.3
Mean Total Area per farmer (ha)	2.7	3.3	1.5	1.7
Groundnuts				
% of farmers	54.9	59.4	29.8	43.7
Mean Number of Fields	0.6	0.6	0.3	0.4
Mean Total Area per farmer (ha)	0.4	0.5	0.1	0.3
Beans				
% of farmers	50.9	50.9	38.7	48.4
Mean Number of Fields	0.6	0.6	0.4	0.7
Mean Total Area per farmer (ha)	0.2	0.2	0.1	0.2
Vegetables				
% of farmers	45.7	50.0	42.7	43.7
Mean Number of Fields	0.9	1.0	0.9	0.8
Mean Total Area per farmer (ha)	0.1	0.2	0.1	0.1

Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.



5.3. Use of Animal and Mechanical Traction, and Chemical Inputs

The use of animal and/or mechanical traction, improved seeds, and chemical inputs is one of the possible avenues to turn low technology agriculture into an intensive – high productivity – system in rural areas of Mozambique. Access to capital to acquire assets like draft power and/or machinery is seriously constrained. Lack of financial resources also constrains smallholder access to chemical inputs. In addition to that, availability of such inputs through open markets is virtually nonexistent. To have an idea about the use of such technologies among smallholders in the Zambezi Valley, the result of the survey concerning the use of animal and mechanical traction, the use of pesticides and fertilizers in selected crops, and the sources of those inputs among users is summarized in Table 8.

Table 8. Use of Animal Traction, and Use and Sources of Chemical Inputs

Animal Traction and Chemical Inputs	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
	---------- % of smallholder households ----------			
Use of Animal and Mechanical Traction				
% w/ Animal Traction	7.7	0.0	5.7	3.1
% w/ Mechanical Traction	0.0	0.0	1.2	4.7
Use of Pesticides (%)				
Tobacco	97.4	-	-	-
Cotton	-	-	95.0	-
Maize	0.0	0.0	0.0	0.0
Groundnuts	0.0	0.0	0.0	0.0
Vegetables	2.1	3.1	0.9	0.0
Use of Fertilizers (%)				
Tobacco	100.0	-	-	-
Cotton	-	-	0.0	-
Maize	29.2	28.1	0.0	0.0
Groundnuts	0.0	0.0	0.0	0.0
Vegetables	3.6	3.1	0.0	0.0
Source of Pesticides - Among users[1]				
Concession Company	93.9	-	96.6	-
Market Place	7.0	-	3.4	-
Other, including give away	3.7	-	0.0	-
Source of Fertilizer - Among users[1]				
Concession Company	98.6	11.1	-	-
Market Place	10.8	88.9	-	-
Other, including give away	0.8	0.0	-	-

[1] The percentages among tobacco growers sum over 100% because some had multiple sources.
Source: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

As expected, the use of animal and mechanical traction is not very common among smallholder farmers in the region. In tobacco areas, over a quarter of the farmers report having cows, but only 7.7% (among tobacco growers) use draft power and none use mechanical traction. No use of either traction is reported among non-growers in those areas. In cotton growing areas, animal traction is used by 5.7% of the growers and 3.1% of the nongrower farmers. Results indicate that 1.2% of growers use mechanical traction, against 4.4% of non-growers doing so.

The use of pesticides in the region is almost exclusively confined to growers of cash crops integrated in contract farming schemes. Indeed, among tobacco growers, 97.4% report using pesticides in tobacco fields, while 2.1% use it in vegetable fields. Among nontobacco growers, about 3.1% report using pesticides in vegetables. In cotton areas, about 95.0% of cotton growers do apply pesticide in cotton fields and 0.9% apply in vegetable fields. There is no application of pesticides among non-growers in cotton areas. Regarding the sources of pesticides, Table 8 indicates that the overwhelming majority of farmers obtain it from the concession companies on credit. Indeed, in tobacco growing areas, 93.9% of tobacco growers report getting some of the pesticides from the company, 7.0% report getting some from the market and 3.7% through other sources, including give-away. In cotton growing areas, 96.6% of the growers get it from the concession company and only 3.4% report getting it from the open market. These results confirm previous findings that pesticide availability through the open market is minimal, and that those transactions result, in many cases, from leakages from the credit system managed by the concession companies. The most common pesticide brands reported include: cypermetrin, cyperpro, cypermercal, Karate, Acephate, Copper, and Dethane.

The use of fertilizers is only observed in tobacco growing areas of the valley. It is primarily channeled through the existing contract farming schemes in tobacco, but is also used by nontobacco growers and is increasingly traded in the open market. Results show that among tobacco growers, 98.6% report that they get some fertilizer from the concession company, 10.8% get some from the open market, and a tiny fraction of less than 1% get it through other channels. Among non-growers, the vast majority, 88.9%, get it through market transactions. Evidence from the field indicates that the fertilizer sold in the open market either originates from informal imports from Malawi or is leaked into the domestic market by tobacco growers getting it from concession companies. The 11.1% of non-growers that report getting it from the concession companies are very likely farmers that somehow get access to the fertilizer distributed to growers in their areas. The most common fertilizer brands include NPK, CAN, and Ureia. Some households also reported the use of organic fertilizers.

5.4. Labor Use Patterns in the Zambezi Valley

In this section we explore the issue of labor use by smallholder household in the study area. Three types of labor considered in the analysis are family labor, temporary hired labor, and permanent hired labor. The survey collected household level data on the permanent labor, and field/crop specific labor use data for each activity in selected crops. The field/crop specific data is on the use of family, permanent and temporary labor in tobacco, cotton, maize, groundnuts, and cassava fields. In this section we are only reporting the results for tobacco, cotton, and maize fields.

5.4.1. Use of Permanent Labor

We start by analyzing the use of permanent labor among smallholder farmers in the study area. Table 9 shows that the use of permanent labor is more common in tobacco growing areas – 66.6% of grower smallholder farmers and 32.1% of non-growers employ some permanent workers. In cotton growing areas, only 9.0% of growers and 3.1% of non-growers employ permanent labor.

Table 9. Use of Permanent Labor

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
% of Farmers using Permanent Labor	66.6	32.1	9	3.1
Mean Number of permanent workers				
Among all farmers	3.3	1	0.3	0.2
Among those who hire	4.8	3.3	3	4
Origin of Permanent Workers (among all) (among those with permanent workers)	------- % of smallholder households ------			
From within the Village	23.6 (35.4)	10.7 (33.3)	3.7 (45.3)	3.1 (100.0)
From within the District	12.9 (19.4)	14.3 (44.4)	2.5 (30.2)	0.0 (0.0)
From another District	7.0 (10.5)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
From Malawi	44.3 (66.5)	21.4 (66.7)	0.0 (0.0)	0.0 (0.0)
Other origins (other province or country)	1.5 (2.2)	0.0 (0.0)	2.0 (24.4)	0.0 (0.0)
Type of Payment among those that paid	------- % of smallholder households ------			
Cash only	2.5	0	30.2	0
In-Kind non-food only	0	0	0	0
In-Kind food only	1.3	0	0	0
Cash + in-kind non-food	1	0	0	0
Cash + in-kind food	62.8	22.2	54.7	0
In-kind non-food + food	0	0	0	0
Cash + In-Kind non-food + food	32.5	77.8	15.1	100
Gender of Permanent Workers	------- % of Permanent workers ------			
Male workers	94.6	100	54.7	100
Female workers	2.2	0	45.3	0
"Underage" workers [2]	3.2	0	0	0

[1] LAE - Labor Adult Equivalent of family resources.
[2] "Underage": 14 or less years of age.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

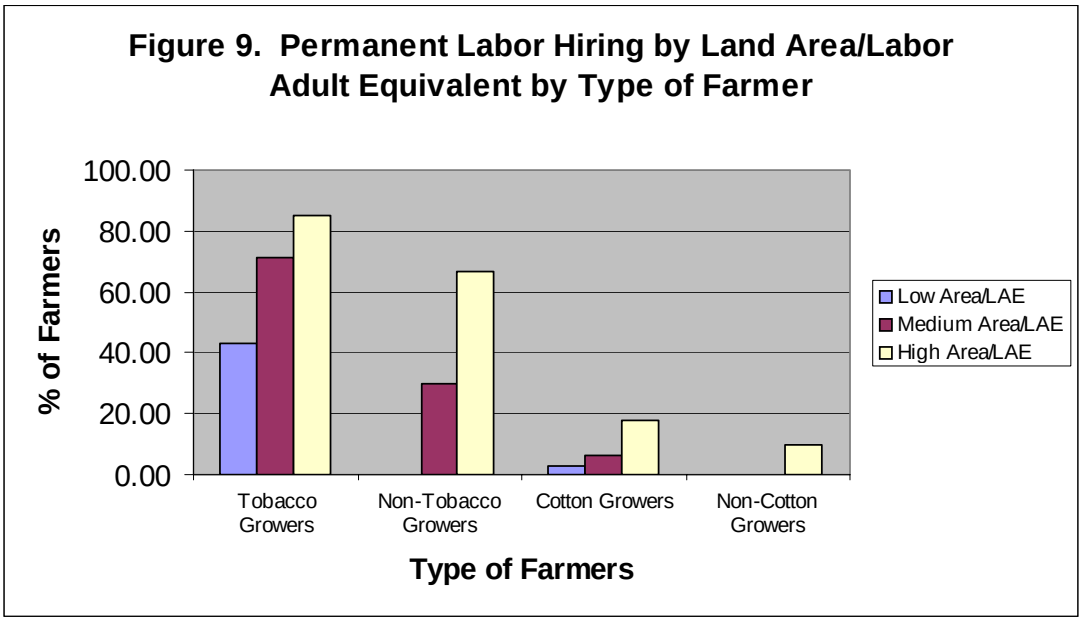


Figure 9 presents the proportion of farmers using permanent labor by terciles of land area cultivated per labor adult equivalent in the household. Results indicate that the demand for permanent labor increases with the area, which suggests that farmers hire permanent laborers to overcome shortages of family labor needed to crop larger areas. Among tobacco growers, for example, in the lowest land area tercile only 43.2% employ permanent labor. The proportion almost doubles to 85.2% for households in the highest land area tercile. The same trends are observed among all other types of farmers.

On average, each of the tobacco growers employs 3.3 permanent workers when all growers are taking into account. The mean number among those 66.6%, that hire permanent workers, is close to 5 workers. The average number used among non-growers in tobacco areas is lower than that (1.0 and 3.3), but is still higher than the ones in cotton growing areas. It is worth noting that there is a wide variation among farmers in each specified farmer type.

An analysis of the origins of permanent workers indicates that in tobacco growing areas about two thirds of the growers and non-growers that hire permanent labor have at least one worker from Malawi. This makes Malawi the single most important source of permanent labor in those areas. The second most important source among tobacco growers in those areas is from within the village; while among non-growers, migrants from other villages within the district are a source. These results suggest that part of the benefits of the current tobacco boom in the Zambezi Valley is leaked into Malawi. That fact, cannot be seen as a negative factor. Indeed, Mozambican farmers are benefitting substantially from the knowledge those migrant workers bring, as many of them were working in tobacco farms for many years. The origin of the few permanent workers in the cotton areas is predominantly from within the village and to a lesser extent from other villages within the same district. International labor migration is not observed in those areas.

Payment to permanent labor may take a number of forms, ranging from exclusively cash, in-kind food or in-kind nonfood, to a combination of those forms. In Table 9, we present the proportion of smallholder farmers (among those that hired) that used specific or combined forms of payment to

permanent workers. The majority of tobacco growers pay either in cash and in-kind food (62.8%) or, add to that, in-kind nonfood payments (32.5%). In reality, we have observed that many of the permanent workers, especially those originated from Malawi are fed with food (maize, etc.) throughout the season and are then paid a specified amount of cash in the end of the season. That cash payment is in some cases in the Malawian currency – Kwacha[4]. Combined forms of payment are also observed in cotton areas. Payments exclusively in cash are also common in those areas, where about 30.2% of the cotton growers pay only in cash.

The gender dimension of the tobacco boom is an important issue. Results in the bottom of Table 9 show that, regarding permanent labor, it is a male dominated phenomenon. Over 94% of the permanent workers employed by tobacco growers, 100% employed by non-growers in those areas, are males. In cotton areas, the situation is more balanced, with growers employing 54.7% of males and 45.3% of females. The use of "under aged" (less than 15 years of age) permanent workers is not common, and only represented 3.2% of the permanents employed by tobacco growers. None of the other farmer types in either area reported employing that type of permanent labor. We will come back to the gender/age issue in a later section.

5.4.2. Structure of Employment by Field Crop

In this section data collected at the field level is used to look at the structure of the labor force in each of the major crops: tobacco, cotton, and maize. Figures 10–12 present the structure of employment observed in the fields which takes into account all the field activities for each crop.

The structure is very different across the different crops. While family labor is predominant in all types of fields (62% in tobacco, 77% in cotton, and 73% in Maize fields), the use of temporary and permanent labor is variable. In tobacco fields (Figure 10), almost a third of the labor force employed in multiple activities is composed of permanent workers and only 9% of temporary workers. In cotton fields (Figure 11), 21% are temporary workers and only 2% are permanent. The structure of labor use in maize fields (Figure 12), indicate that about 14% are temporary workers and approximately the same proportion (13%) are permanents. This result is indicative of the fact that many of the laborers of all types engaging in cash cropping are also used in food crop production. Since we did not separate the maize fields per cash cropping area, the results here represent an average situation across cotton and tobacco areas.

[4] Both firms promoting contract farming schemes in the area are trying to create incentives to increase the use of the Mozambican currency. Indeed, the proportion of the payments that the firms make to farmers in Malawian Kwacha has been drastically reduced in recent years.

Figure 10. Distribution of Employment by Type in Tobacco Fields

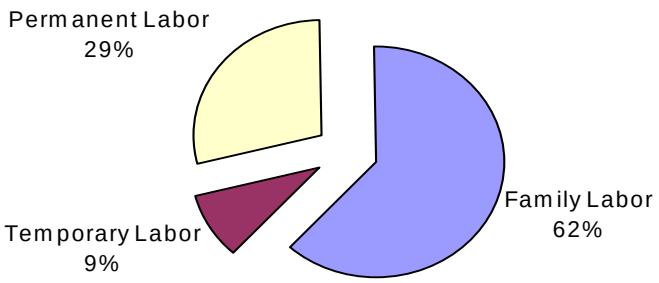


Figure 11. Distribution of Employment by Type in Cotton Fields

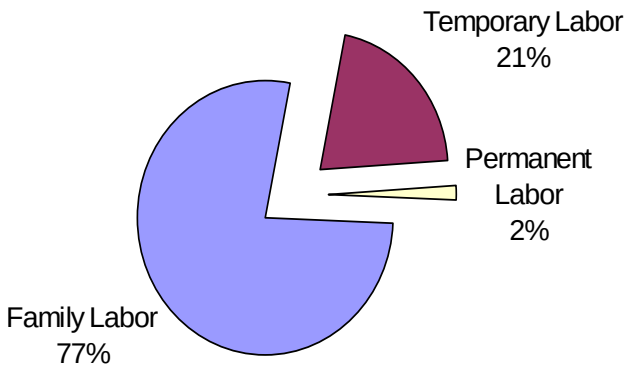
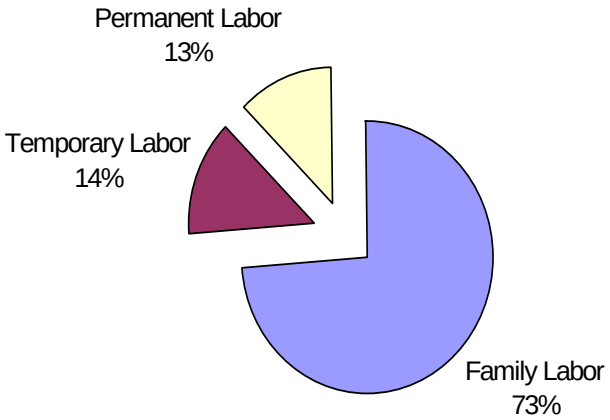


Figure 12. Distribution of Employment by Type in Maize Fields



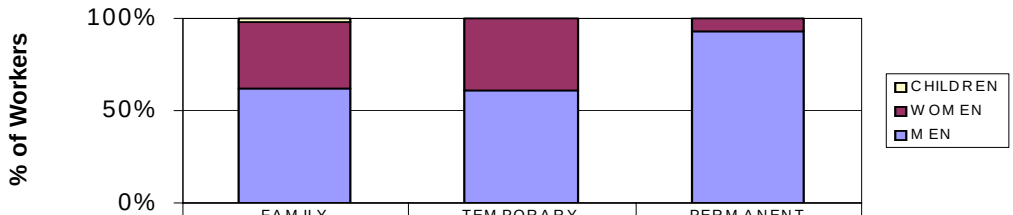
5.4.3. Gender/Age Distribution of Employment by Crop and Labor Type

The gender/age distribution of employment is now examined more closely. For each major crop, we analyzed the gender/age composition by type of labor. The results are very similar to the aggregated analysis performed earlier in this report. Figures 13–15 illustrate the results.

In tobacco fields, male labor is predominant in all types of labor – about 61.6% of family workers, 61.1% of temporary workers, and 93.3% of permanent workers are male adults. Female adults are the second most important category. As we pointed out in earlier sections, underage labor incidences are minimal. Figure 13 confirms that the share of underage workers is generally low and relatively higher with family labor (1.6%) than with temporary labor (0.2%) or permanent labor (0.1%).

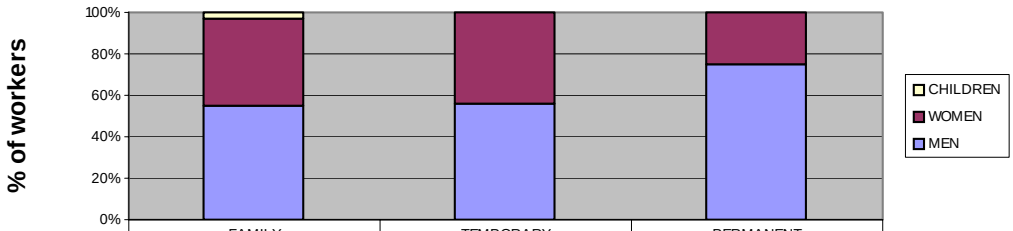
The same patterns are observed in cotton and maize fields. Male labor is predominant in all types of labor engaged in cotton fields – about 55.3% of family workers, 55.9% of temporary workers, and 75.0% of permanent workers are male adults. Female adults are the second most important category. Underage labor constitutes 2.9% of the family labor and only 0.2% of temporary workers employed in cotton fields. The results for cotton fields are illustrated in Figure 14. The same type of result is found for maize fields – see Figure 15.

Figure 13. Gender Distribution of Employment in Tobacco Fields, by Type of Labor



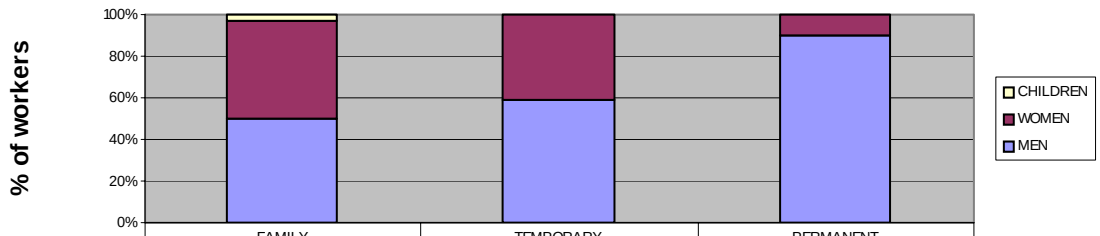
	FAMILY	TEMPORARY	PERMANENT
CHILDREN	1.6	0.2	0.1
WOMEN	36.8	38.7	6.6
MEN	61.6	61.1	93.3

Figure 14. Gender Distribution of Employment in Cotton Fields, by Type of Labor



	FAMILY	TEMPORARY	PERMANENT
CHILDREN	2.9	0.2	0.0
WOMEN	41.8	43.8	25.0
MEN	55.3	55.9	75.0

Figure 15. Gender Distribution of Employment in Maize Fields, by Type of Labor



	FAMILY	TEMPORARY	PERMANENT
CHILDREN	2.7	0.4	0.1
WOMEN	47.5	40.6	9.8
MEN	49.8	59.0	90.1

5.4.4. Magnitude of Labor Use/Demand by Field Crop by Type of Labor

Using the detailed data on labor use collected on individual fields, we computed the average number of workers of a specified type (family, temporary, and permanent) that was used on average for each field activity in tobacco, cotton, and maize fields. For each activity, the average is calculated across all farmers that undertook the activity. It is important to note that, if a farmer performed a given activity in his field and only used one type of labor, say family, a positive number will enter in the calculation of the mean for family labor. For temporary and average labor that were not used in that particular activity, zero will enter in the calculation of the means for those labor types in that particular activity. Following this rule, the average number calculated for each activity over time (following the field activities) represents the average household demand for labor for a specific crop/field activity throughout the season.

Labor use by type in tobacco field activities is presented in Figure 16. Figure 17 presents labor use in a single line that sums up the three types of labor. A few points are worth emphasizing. First, family and permanent labor are used in higher numbers than temporary labor in all activities, except in land clearing. Second, the average number of workers in any given type is highly variable depending on the type of activities performed. Third, overall, despite the high variation, some important peaks in demand are identified in land preparation, transplanting, and harvesting. Fourth, in general, there is an increasing use of permanent labor as the season moves from land clearing up to the baling phase. Fifth, the main peaks identified for each type of labor are as follows: family labor (3 workers in transplanting and close to 4 workers in harvesting), temporary labor (just over 2 workers in land clearing, just over 1 worker in transplanting, weeding, harvesting and tobacco drying), and for permanent labor (4 workers in harvesting and 5 workers in tobacco baling). Finally, in Figure 17, we can see that the average total number of workers throughout the season (across the various field activities) ranges from 4 to 8, and that this relative stability is a reflection of some important substitutions that may occur between the different labor types in Figure 16.

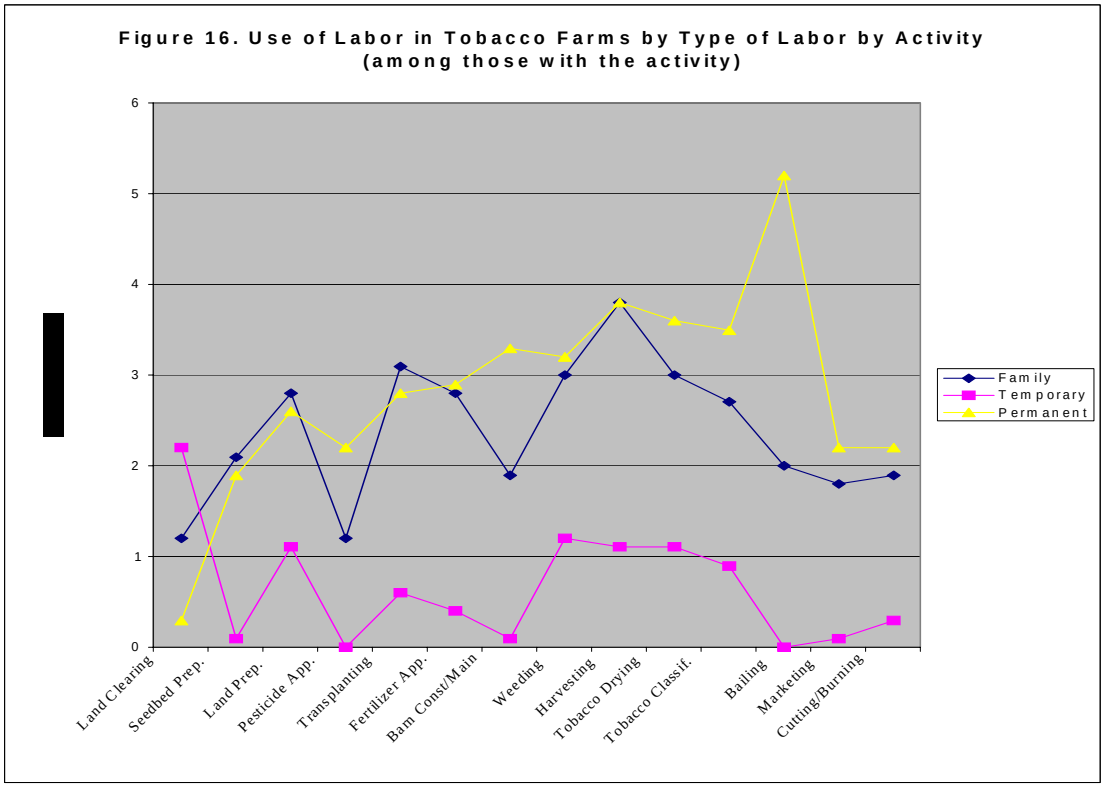


Figure 16. Use of Labor in Tobacco Farms by Type of Labor by Activity
(among those with the activity)
6
5
4
3
2
1
0
Land Clearing
Seedbed Prep.
Land Prep.
Pesticide App.
Transplanting
Fertilizer App.
Barn Const/Main
Weeding
Harvesting
Tobacco Drying
Tobacco Classif.
Bailing
Marketing
Cutting/Burning
Family
Temporary
Permanent

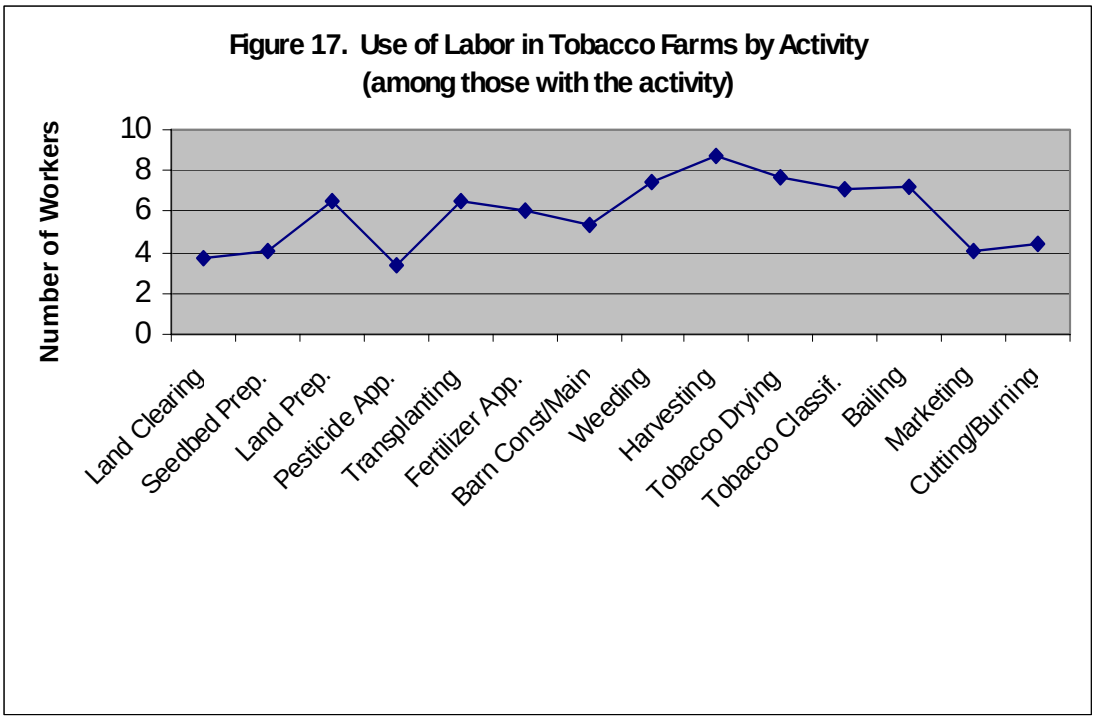


Figure 17. Use of Labor in Tobacco Farms by Activity
(among those with the activity)
Number of Workers
10
8
6
4
2
0
Land Clearing
Seedbed Prep.
Land Prep.
Pesticide App.
Transplanting
Fertilizer App.
Barn Const/Main
Weeding
Harvesting
Tobacco Drying
Tobacco Classif.
Bailing
Marketing
Cutting/Burning

The use of labor in cotton fields presented in Figures 18 and 19 is somewhat different. First, family labor is significantly more important than the temporary and permanent labor. Second, temporary labor basically follows the same trends as family labor demand/use, but at much lower levels. There are, however, two exceptions exactly at the peaks of demand for the two types of labor – that is weeding (just over 3 family workers and 2.5 temporary workers) and harvesting when 4 workers of each of those types of labor are used. Third, the cotton calendar activity with the least labor use is pesticide application. That activity also demanded relatively less labor in tobacco. Finally, the average total number of workers across tobacco field activities has a much wider variation, ranging from around 2 (in land clearing, pesticide application and marketing) to over 7 in the harvesting season.

Figure 18. Use of Labor in Cotton Farms by Type of Labor by Activity (among those with the field activity)

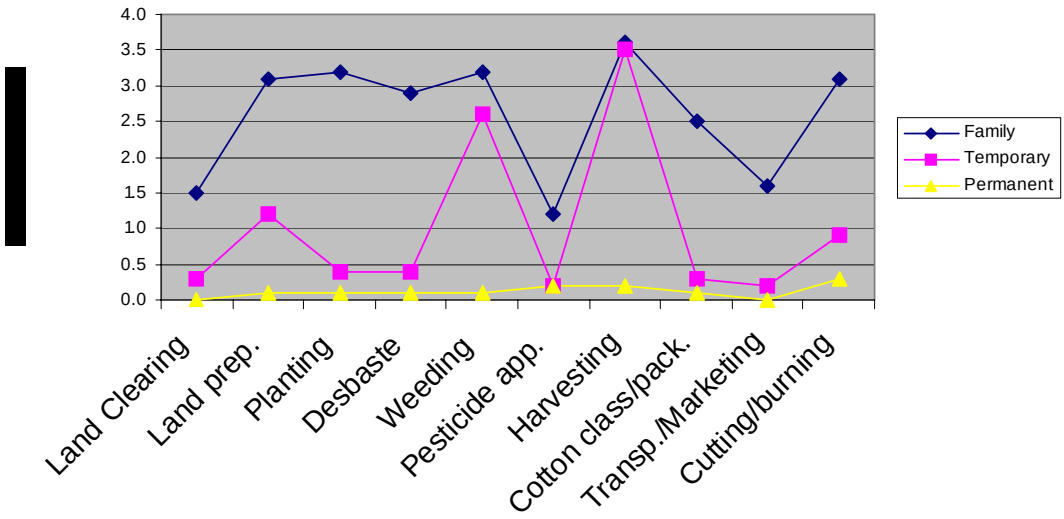
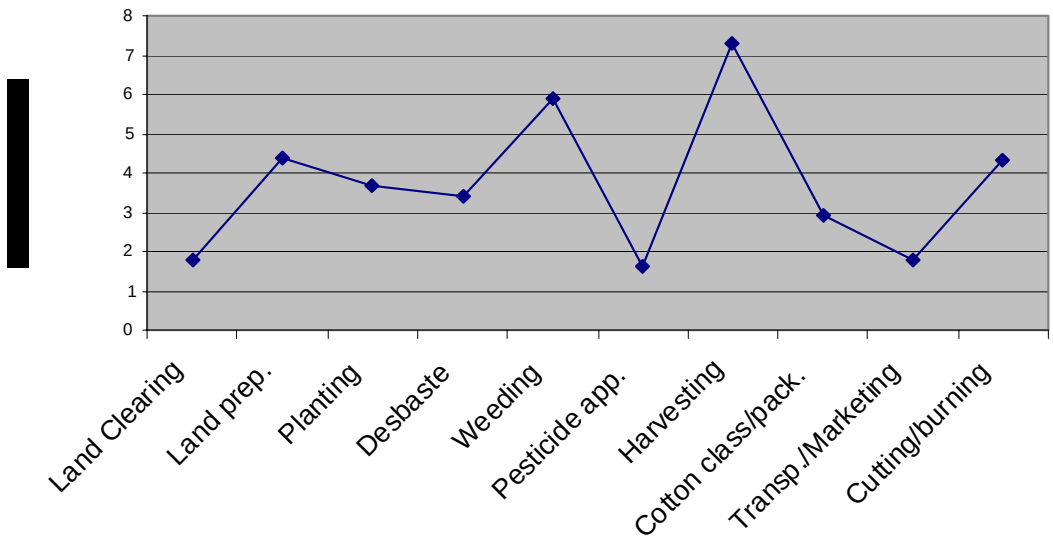
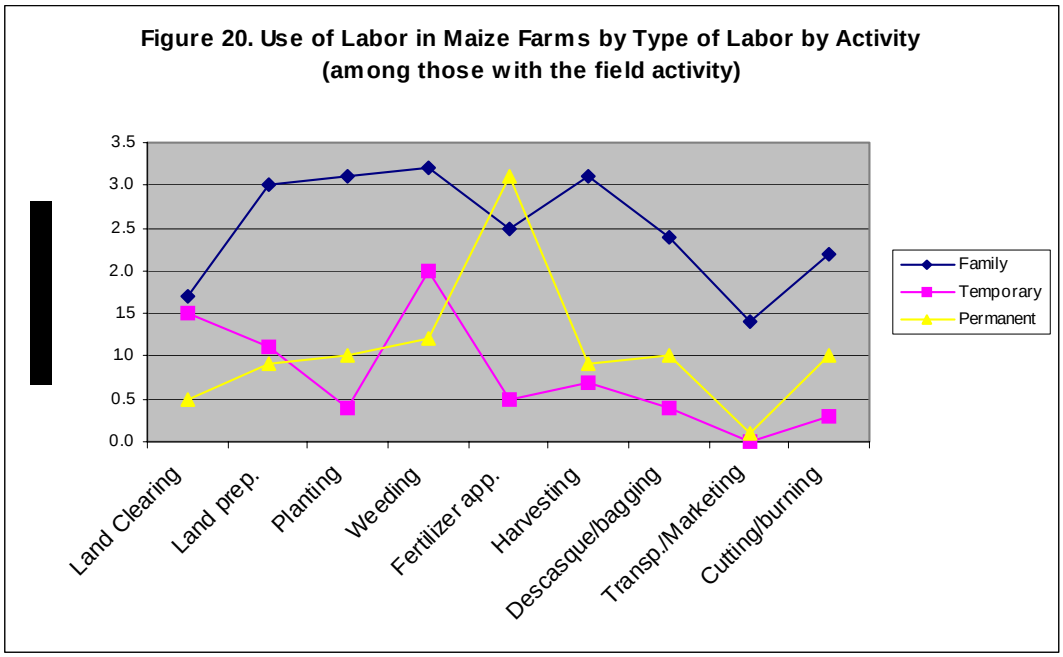


Figure 19. Use of Labor in Cotton Farms by Activity (among those with activity)



The results for the maize fields are presented in Figures 20 and 21. Table 10a1 through 10c2 present detailed number on proportion of farms using specific typed of labor, mean number of workers, mean number of man days, and average wage rate by crop by field activity.



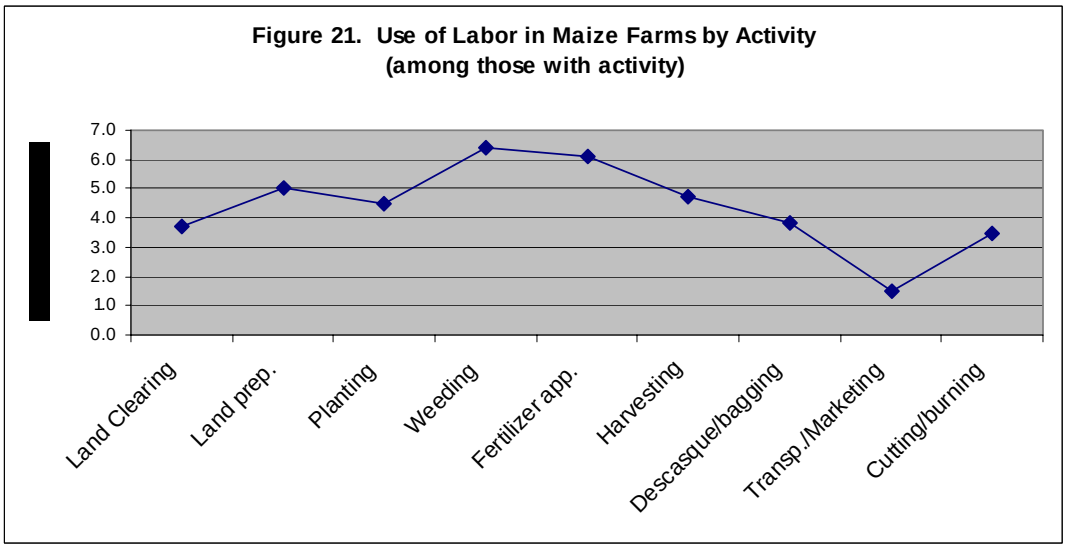


Table 10a1. Use of Labor by Type in TOBACCO, by Field Activity

Type of Field Activity	Type of Labor Used – % of Growers and Average Number of Workers by Type of Field Activity [1]								
TOBACCO	Family Labor			Temporary Labor			Permanent Labor		
	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)
Land Clearing	91.7	1.2	1.3	30.6	2.2	7.3	19.4	0.3	1.7
Seed bed preparation	97.3	2.1	2.1	3.3	0.1	3.6	40	1.9	4.8
Land preparation	94	2.8	3	16	1.1	6.8	46	2.6	5.7
Pesticide Applications – Seed beds	96.3	1.2	1.3	1.2	0	6	42.6	2.2	5.2
Transplanting	97.2	3.1	3.3	11.6	0.6	4.8	52.7	2.8	5.4
Fertilizer Applications	96	2.8	3	8.7	0.4	5.7	53	2.9	5.3
Barn construction/maintenance	74.5	1.9	2.1	5.4	0.1	1.8	45.9	3.3	5.1
Weeding	96	3	3.2	16	1.2	7.4	54.7	3.2	5.5
Harvesting	99.3	3.8	3.9	13.1	1.1	8.6	61.3	3.8	6.2
Tobacco drying	97.8	3	3.1	12.4	1.1	9	61.3	3.6	5.8
Tobacco Classification	95.7	2.7	2.8	8.6	0.9	10.1	59.7	3.5	5.8
Baling	92.6	2	2.1	1.5	0	2	64.7	5.2	8
Marketing of Tobacco	97.7	1.8	1.8	3.1	0.1	2.3	53.8	2.2	4.1
Cutting and burning of plants	86.4	1.9	2.2	8	0.3	3.7	45.5	2.2	4.8

(1) Among all tobacco growing households. Mean number of workers is averaged across all that undertake the activity. (2) Among all tobacco growing households. Mean number of workers is averaged across those that employed specific type of labor in the activity. Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Table 10a2. Average Man-Days, and Wage Rate in TOBACCO, by Field Activity by Type of Labor

Type of Field Activity	Average Number of Man-Days by Field Activity by Labor Type		
TOBACCO	Family Labor	Hired Labor	Estimated Wage Rate ($US/person/day)
	-1	-1	
Land Clearing	32.03	60.94	1.55
Seed bed preparation	63.21	96.73	0.65
Land preparation	60.86	93.46	0.97
Transplanting	12.94	26.51	2.50
Fertilizer Applications	7.28	13.97	1.85
Barn construction/maintenance	15.52	34.1	0.89
Weeding	24.22	55.09	0.61
Harvesting	146.77	205.27	0.66
Tobacco drying	116.64	163.59	0.41
Tobacco Classification	64.81	125.99	0.54
Baling	17.00	75.07	0.43
Marketing of Tobacco	4.51	7.28	2.12
Cutting and burning of plants	21.18	21.93	0.78

(1) Mean number of man-days is averaged across all that undertake the activity, even if they did not use that specific type of labor.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Table 10b1. Use of Labor by Type in COTTON, by Field Activity

Type of Field Activity	Type of Labor Used – % of Growers and Average Number of Workers by Type of Field Activity [1]								
COTTON	Family Labor			Temporary Labor			Permanent Labor		
	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)
Land Clearing	88.2	1.5	1.7	17.6	0.3	1.7	0	0	0
Land preparation	97.8	3.1	3.2	18.3	1.2	6.5	4.3	0.1	1.8
Planting	100	3.2	3.2	12.8	0.4	3.2	4.3	0.1	1.8
Desbaste	100	2.9	2.9	10.1	0.4	3.7	3.4	0.1	2
Weeding	100	3.2	3.2	42.4	2.6	6.2	5.4	0.1	1.5
Pesticide application	95	1.2	1.3	15	0.2	1	10	0.2	1.5
Harvesting	100	3.6	3.6	32.2	3.5	10.9	6.7	0.2	3.3
Cotton classification and packing	100	2.5	2.5	9	0.3	3.5	5.6	0.1	2.4
Transportation/Marketing	100	1.6	1.6	8	0.2	2.3	1.3	0	2
Cutting and burning of plants	94.1	3.1	3.3	11.8	0.9	7.5	11.8	0.3	2.5

(1) Among all cotton growing households. Mean number of workers is averaged across all that undertake the activity.
(2) Among all cotton growing households. Mean number of workers is averaged across those that employed specific type of labor in the activity.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Table 10b2. Average Man-Days in COTTON, by Field Activity by Type of Labor

Type of Field Activity	Average Number of Man-Days by Field Activity by Labor Type		
COTTON	Family Labor	Hired Labor	Estimated Wage Rate ($US/person/day)
	-1	-1	
Land Clearing	62.29	2.53	1.08
Land preparation	81.70	8.75	1.44
Planting	28.53	2.09	1.93
Desbaste	26.79	5.06	1.52
Weeding	56.71	20.11	1.43
Pesticide application	3.2	0.4	3.28
Harvesting	131.1	135.86	0.67
Cotton classification and packing	24.54	10.31	0.83
Transportation/Marketing	2.39	0.61	1.72
Cutting and burning of plants	36.00	17.09	0.4

(1) Mean number of man-days is averaged across all that undertake the activity, even if they did not use that specific type of labor.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Table 10c1. Use of Labor by Type in MAIZE, by Field Activity

Type of Field Activity	Type of Labor Used – % of Growers and Average Number of Workers by Type of Field Activity [1]								
MAIZE	Family Labor			Temporary Labor			Permanent Labor		
	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)	% of Growers	Mean # of Workers (1)	Mean # of Workers (2)
Land Clearing	88.6	1.7	2	20	1.5	7.3	20	0.5	2.3
Land preparation	97.9	3	3.1	16.7	1.1	6.8	23.5	0.9	4
Planting	99.7	3.1	3.1	7.8	0.4	4.6	25.9	1	3.7
Weeding	98.3	3.2	3.2	27.9	2	5.2	27.2	1.2	4
Fertilizer application	100	2.5	2.5	4.1	0.5	11.5	65.3	3.1	4.7
Harvesting	98.9	3.1	3.1	13.4	0.7	5.4	22.6	0.9	4.1
Descasque debulha and bagging	95.6	2.4	2.6	11.1	0.4	4	11.1	1	9.2
Transportation/Marketing	100	1.4	1.4	0	0	0	4	0.1	2
Cutting and burning of plants	90.6	2.2	2.4	11.5	0.3	2.8	25	1	4.1

(1) Among all maize growing households. Mean number of workers is averaged across all that undertake the activity.
(2) Among all maize growing households. Mean number of workers is averaged across those that employed specific type of labor in the activity.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Table 10c2. Average Man-Days in MAIZE, by Field Activity by Type of Labor

Type of Field Activity	Average Number of Man-Days by Field Activity by Labor Type		
MAIZE	Family Labor	Hired Labor	Estimated Wage Rate ($US/person/day)
	-1	-1	
Land Clearing	53.69	42.83	0.75
Land preparation	74.54	33.77	1.52
Planting	19.32	7.29	3.66
Weeding	60.71	29.16	1.09
Fertilizer application	7.00	3.83	0.90
Harvesting	57.02	30.17	0.47
Descasque debulha and bagging	19.53	21.82	0.64
Cutting and burning of plants	32.98	19.79	0.75

(1) Mean number of man-days is averaged across all that undertake the activity, even if they did not use that specific type of labor.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

5.5. Patterns of Food Crop Production and Sales

All households in cash cropping areas get engaged in multicropping, i.e., they grow a combination of crops to meet their cash and immediate food security objectives. While not all households engage in cash crops grown under contract farming, food crop production is common among virtually all smallholders. Food crops are primarily grown for own household consumption, but when marketing opportunities emerge, some households take advantage and sell it for cash. In tobacco economies, food crops like maize and peanuts are used to make in-kind payments to permanent labor. Given that cash crop growers spend considerable amount of their resources to grow tobacco or cotton, their maize production is seldom sufficient to meet own consumption needs and the demand associated with permanent labor payments. Those needs are normally complemented by local market purchases that are normally supplied by noncash crop growers operating in those same areas. Furthermore, food crops like maize and groundnuts are part of the input package in some tobacco growing areas and form part of the crop rotation recommendation – to grow tobacco in one season, then maize to take advantage of the residual fertilizer, and then groundnuts for nitrogen fixation. Table 11 presents results related to the production and sales of food crops among farmers in cotton and tobacco growing areas.

Maize is widely grown in all areas and across all types of farmers. In both areas, all noncash cropping smallholders grow maize, and 99% of the cash crop growers do so. In some tobacco growing areas, maize seed is part of the standard input package provided by the contract farming firm. Production per farmer between tobacco growers and non-growers is very similar. Given that tobacco growers crop a smaller area than non-growers (2.7 ha vs 3.3 ha), their yield is somewhat higher – 788 kgs/ha against 642 kgs/ha among non-growers. Seeds associated with the fertilizer provided for the tobacco crop, and the recommended crop rotation are potential sources for this difference. In cotton growing areas, non-growers produce more maize in a larger area and achieve higher yields. In both areas, maize sales are more frequent among noncash crop growers.

Over half of the tobacco growers and approximately two-thirds of nontobacco growers grow groundnuts. As expected, a higher share of noncash crop growers does sell ground nuts – 40% – compared to only 8.8% among tobacco growers. Among growers of groundnuts, the percentages are 53.3% among nontobacco growers and 15.8% among tobacco growers. In cotton areas, about 18% of non-growers of cotton sell groundnuts and only 5.4% of the growers do so. Among growers of groundnuts in cotton areas the incidence of sellers is 41.2% among cotton non-growers and 19.6% among cotton growers.

The incidence of bean production and marketing is not very different between the two groups of farmers in tobacco areas. Results indicate that non-growers of cotton are just slightly more likely to grow beans (50.0% among non-growers and 44.9% among growers). The percentage of sellers among those growing is 20% among tobacco growers and 17% among nontobacco growers. In cotton areas growers (33.9%) are just slightly less likely than non-growers (35.9%) to grow beans. No marketing of beans is reported among noncotton growers, and about 16.5% of the cotton growers that grow groundnuts do sell some.

Table 11. Patterns of Crop Production and Sales

Selected Crops	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Maize				
% of farmers Growing	99.1	100.0	98.8	100.0
Mean Production per farmer (kgs) - all	2,127.0	2,117.1	1,017.7	1,295.8
% of farmers selling among all farmers	6.6	25.0	16.0	57.5
Mean Sales per farmer (kgs) - all	109.7	132.2	91.4	158.5
% of farmers selling among those growing	6.8	25.0	16.2	57.5
Mean Sales per farmer (kgs) - among those selling	600.9	529.0	234.7	275.6
Groundnuts				
% of farmers Growing	56.9	71.4	27.4	40.6
% of farmers selling among all farmers	8.8	40.0	5.4	17.5
% of farmers selling among those growing	15.8	53.3	19.6	41.2
Beans				
% of farmers Growing	44.9	50.0	33.9	35.9
% of farmers selling among all farmers	8.6	10.0	5.7	0.0
% of farmers selling among those growing	19.4	16.7	16.5	0.0
Vegetables				
% of farmers Growing	35.1	42.8	32.2	34.4
% of farmers selling among all farmers	6.5	35.0	8.6	25.0
% of farmers selling among those growing	19.0	77.8	27.4	50.0
Fruits				
% of farmers Growing	6.1	14.3	15.3	4.7
% of farmers selling among all farmers	3.6	5.0	9.6	0.0
% of farmers selling among those growing	60.9	50.0	61.9	0.0

Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Overall, vegetable production is observed for less than 50% of the farmers. In tobacco growing areas it is done by about 35.1% of the growers and 42.8% of the non-growers. Among those producing vegetables, only about 19% of the tobacco growers sell some. In those same tobacco areas, over two thirds (77.8%) report selling some of the vegetables they grow. Remember that fertilizer use was reported in some vegetable fields in these areas. In cotton growing areas, growers (32.2%) and non-growers (34.4%) are almost equally likely to grow vegetables, but non-growers are more likely to sell. While among those growing, about 50% of those that are non-growers of cotton report selling, while only 27.4% of cotton growers that also grow vegetables report selling some of their production.

Fruit cropping is relatively low in the study area. In tobacco growing areas, fruit cropping is more common among nontobacco growers (14.3%) than among tobacco growers (6.1%). However, market participation among fruit producers is more likely among tobacco growers. In cotton growing areas, cotton growers are more likely to get engaged in fruit production and also more likely to market those fruits.

5.6. Ownership of Production Assets

The ownership of means of production in Mozambican agriculture is essentially confined to simple manual tools. Results presented in Table 12 indicate that the ownership of mechanical assets such as tractors, is null among sampled smallholder growers. In contract, all households own at least one *enxada*, and the vast majority have *catanas*, *machados* and *foices*. In both tobacco and cotton cash cropping areas, cash cropping farmers tend to have a higher number of assets. For example, tobacco growers have an average of 8.1 *enxadas*, and non-growers have only about 5.6 *enxadas*. In cotton areas the difference is less accentuated, with growers owning an average of 5.0 against 4.2 among noncotton growers. Those differences are a function of the area cultivated, and the number of workers employed by those different types of farmers.

Other important assets include *watering cans* among tobacco growers (97.8%) and even among non-growers in those areas (59.4%). Watering cans are used to water the seed beds and are part of the input package provided in contract farming arrangements in tobacco. The use of watering cans in cotton growing areas is far less common and is mostly used in vegetable fields.

Table 12. Ownership of Assets by Smallholder Farmers

Type of Assets	--- % of Smallholder Farmers that Own and Mean Number of Assets Owned ---							
	Tobacco Areas				Cotton Areas			
	Growers		Non-growers		Growers		Non-growers	
	% of farmers	Mean # Owned	% of farmers	Mean # Owned	% of farmers	Mean # Owned	% of farmers	Mean # Owned
1 Enxadas	100	8.1	100	5.6	100	5	100	4.2
2 Catanas	78.7	2.8	81.2	1.5	70.9	1.2	65.6	1.3
3 Machados	92.7	3.5	84.4	1.8	88.4	2.1	95.3	1.9
4 Pás	19.4	0.2	18.7	0.3	12.3	0.1	15.6	0.2
5 Ancinhos	10.1	0.3	12.5	0.2	7.3	0.1	6.2	0.1
6 Foices	78.8	2.6	59.4	1.1	50.2	0.7	54.7	0.6
7 Limas	21.6	0.2	12.5	0.2	11.6	0.2	15.6	0.2
8 Charruas p/ Tracção	7.3	0.1	3.1	0	2.8	0.1	3.1	0
9 Tractores	0	-	0	-	0	-	0	-
10 Charruas p/ Tractor	0	-	0	-	0	-	0	-
11 Motobomba	0	-	0	-	1.2	0	4.7	0
12 Barcos/Redes	0.7	0	3.1	0	1.2	0	0	-
13 Regadores	97.8	4.1	59.4	1.2	15.4	0.2	26.6	0.4
14 Bicicletas	86.6	1.3	81.2	1.2	77.6	1.1	64.1	0.8

Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Bicycles are an important means of transportation in rural Mozambique. They, along with radios, are normally associated with the status of households. Walker et al. (2004) find that households that own a bike have incomes that are 26% higher than those that do not. Bicycles are normally used to transport agricultural goods to marketing points. Results show that, in tobacco growing areas, 86.6% of growers and 81.2% of non-growers have at least one bicycle. The average number of bikes per household is just slightly higher among grower smallholders. The proportion of households with bikes in cotton growing areas is smaller – 77.6% among growers and 64.1% among non-growers. Growers in cotton areas tend to have a larger number of bikes than non-growers.

5.7. Ownership and Marketing of Livestock

The main types of animals owned by households in the Zambezi Valley area are cows, goats, pigs, and chickens. Previous research (Walker et al. 2004) has shown an important positive relationship between the ownership of a large number of animals (cows, goats, and chickens) and household welfare. Those animals are used for multiple purposes such as household food security and traditional rites, as well as a household savings/assets.

In this study (Table 13) we find that in both tobacco and cotton growing areas, smallholders engaged in contract farming are more likely to have cows than nonparticipating households – 29.1% (growers) and 21.9% (non-growers) in tobacco areas, and 12.8% (growers) and 10.9% (non-growers) in cotton growing areas. Cash crop growers in both areas also own on average more cows than non-growers. Sales of cows are not frequent and are only reported among tobacco growers (6.2%) and cotton growers (1.9%).

In tobacco growing areas, there is no statistical difference in the likelihood of having goats and in the average number of goats owned by tobacco and nontobacco growers at the time of the survey – about 68% in each type own goats, and among those each own an average of 6 goats. With respect to the marketing of goats, results indicate that nontobacco growers (31.2%) are more likely to sell than tobacco growers (19.0%).

The ownership of pigs is more common among nontobacco growers (40.6%) and cotton growers (49.1%), than among tobacco growers and cotton non-growers. Marketing of pigs is also more common in those two groups of households – around 21% of them report selling some pigs.

Chicken ownership is quite common across the country. In the study area, about 94.5% of tobacco growers, 87.5% of non-growers in tobacco areas, 90.8% of cotton growers and 93.8% of noncotton growers in cotton growing areas report having some chickens. Across the area, the average number of chickens among those owning varies from 9 among noncotton growers in cotton areas, to approximately 14 among households (growers and non-growers) in tobacco growing areas. About 34.3% of tobacco farmers report selling chicken, and only 28.1% of nontobacco growers report doing so. In cotton areas, chicken marketing appears to be more active, with over 50% of non-growers reporting some selling, and 42.2% of cotton growers also doing so.

Table 13. Ownership and Sale of Livestock

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Cows				
% of Growers owning	29.1	21.9	12.8	10.9
Mean number – among all farmers	1.4	0.6	0.5	0.3
Mean number – among owners	4.9	2.6	3.7	2.3
% of Growers Selling	6.2	0	1.9	0
Goats/sheep				
% of Growers owning	67.5	68.7	70.1	62.5
Mean number – among all farmers	3.9	3.8	6.8	6.5
Mean number – among owners	5.8	5.6	9.7	10.4
% of Growers Selling	19	31.2	35.1	34.4
Pork				
% of Growers owning	36.3	40.6	49.1	28.1
Mean number – among all farmers	1.6	1.2	2.9	2
Mean number – among owners	4.7	3	5.9	7.1
% of Growers Selling	13.7	21.9	21.2	10.9
Chickens				
% of Growers owning	94.5	87.5	90.8	93.8
Mean number – among all farmers	13.1	12.1	11	8.7
Mean number – among owners	13.9	13.9	12.1	9.3
% of Growers Selling	34.3	28.1	42.2	53.1

Note: The mean number refers to the existing quantity in February of 2004, six months into the 2003/4 season.
Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

5.8. Smallholder Income Diversification

An important part of income earning strategies by smallholder households in the Zambezi Valley is what is conventionally referred to as *income diversification* – the allocation of smallholder household labor to farm and non-farm activities other than the cropping of their own fields or livestock production. It includes the allocation of labor to the following activities: (i) employment in the rural non-farm labor market; (ii) self-employment in rural micro and small enterprises; (iii) employment in the farm labor market; and (iv) employment in the migration labor market (Reardon 1997; Benfica 1998); or even reliance on pensions or other forms of long-term transfers/benefits from private or public sector institutions. This section looks closely on each of these income sources. We separate the analysis in two periods. The first period runs from September/03 (officially considered the beginning of the season for many crops) to February/04,

which coincides with the initial phase of the tobacco harvesting season. The second period that runs from March/04 to August/04, picks up the tobacco harvesting and marketing as well has the harvesting of many other crops, including maize and cotton.

5.8.1. Micro Enterprise Activity

Smallholder household diversification into micro and small enterprises is generally emphasized in the micro and small enterprise literature. It shows that in most of Africa, the majority of firms start as one person firms, i.e., strictly self-employment and that only a minority of micro enterprises "graduate" to employing more than five workers, generally unpaid family members. Unlike selling labor, diversification into micro and small enterprise requires, not only skills but also start up capital and, in some cases, physical assets. Locational factors also play an important role in determining the overall level of activity and profitability in this sector (Benfica 1998).

In this section we look at different dimensions of the smallholder MSE sector. First, we present the incidence of MSE activity by type of smallholder by time period – September/03 to February/04, and March/04 to August/04. Then we look at the structure of the sector by dividing the firms by sector by type of smallholder by time period. Finally, we look at the issue of firm size by type of smallholder by time period.

During the period running from September/03 to February/04 the incidence of MSE activity was very similar across all the household types – about 45–55% of households had some form of small non-farm business. In the period following the harvest of tobacco (after the end of the first quarter of 2004) and maize and cotton (after the end of the second quarter of 2004), Figure 22 shows that the proportion of smallholder engaged in MSE activity increased for all types of smallholder households. That increase may have been a result of increased effective demand following (or during) the marketing of major crops. Also, evidence has shown that, typically, a number of smallholders expanded existing business or initiated new businesses in that period.

Figures 23 and 24 show that, in tobacco growing areas, the MSE sector in both periods was dominated by trading followed by processing activities (particularly foods and beverages). Trading and services were also important in cotton growing areas. In all areas, the service sector was not very strong, but became more frequent in the second part of the agricultural season when more cash was available in the local economy.

Results on the size of MSEs are as expected. Many of the firms in both phases were one person businesses, i.e., strictly self employment MSEs. Results in Figures 25 and 26 suggest that the expansion in the MSE sector reported in previous figures was more through new one person businesses than through firm expansion. Indeed the proportion of firms with three or more people shrank relatively to firms with one or two workers for all smallholder categories, except for noncotton growers, for whom one person businesses became more common than the two person businesses. Still, in cotton areas, cotton growers seem to have expanded considerably their businesses to employ one additional worker.

Figure 22. Incidence of Households with MSEs by Type of Smallholder by Period

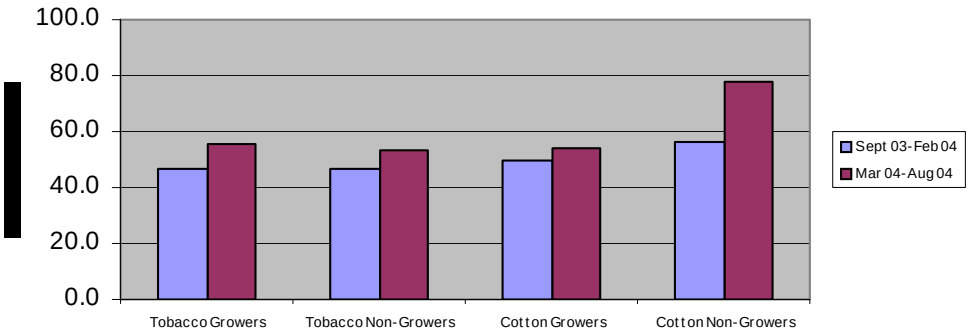


Figure 23. Structure of the MSE Sector by Type of Smallholder
(September 03 - February 04)

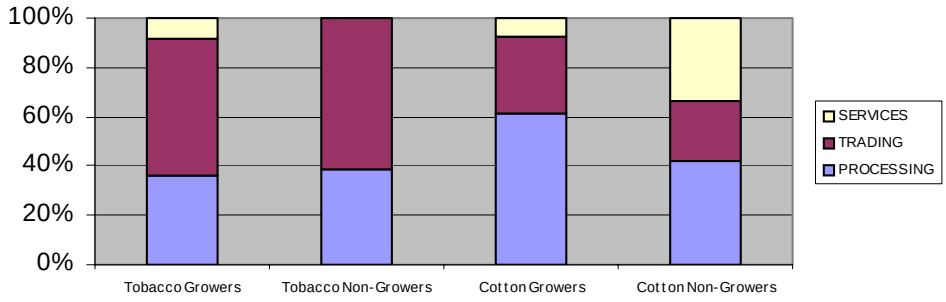
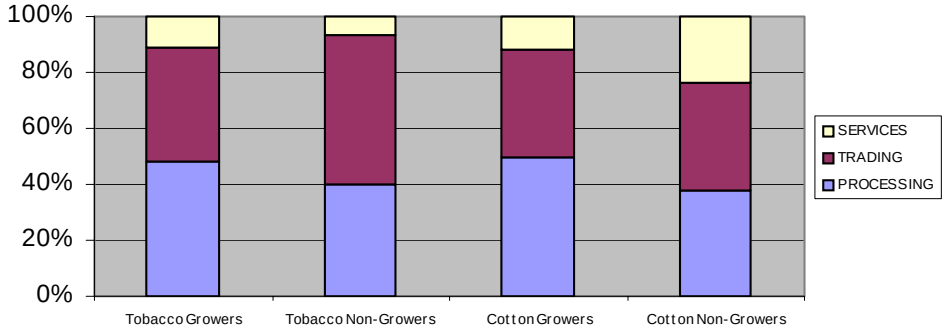
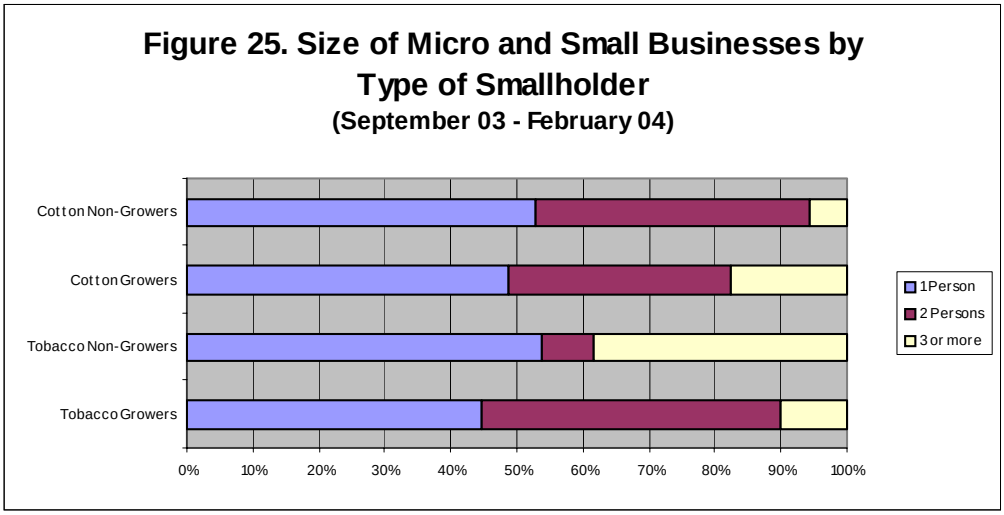
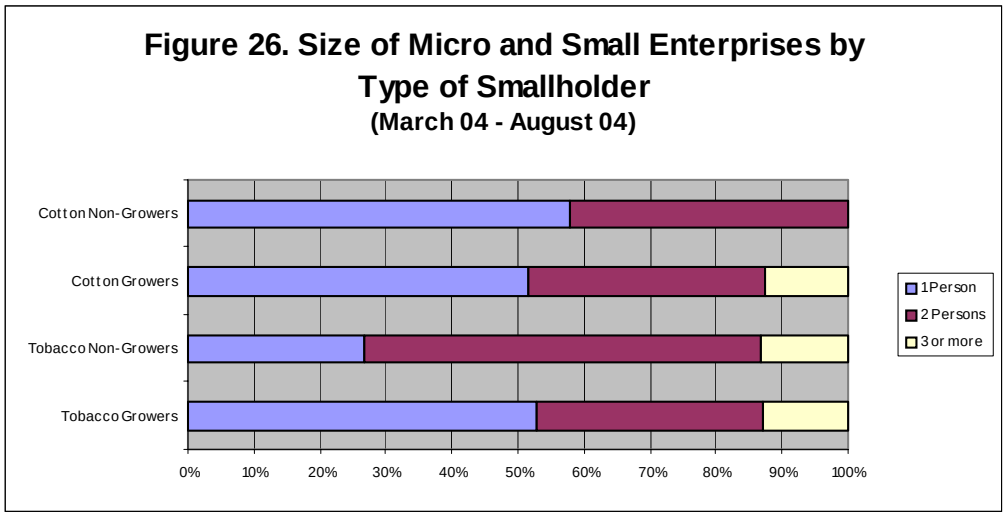


Figure 24. Structure of the MSE Sector by Type of Smallholder
(March 04 - August 04)







5.8.2. Farm and Non-farm Wage Labor

Smallholder household labor supply is likely to be influenced both by smallholder household characteristics, such as household size and capital and overall asset endowments, education, gender of the head, and regional cropping characteristics (Benfica 1998; Tschirley and Benfica 2001). For instance, poor households with excess labor, and lack of land and skills are more likely to supply labor both to other smallholder households farms and to micro and small enterprises. Moreover, the farm labor supply is likely to be higher in cash crop labor intensive zones, especially in cotton and tobacco growing areas, where labor demand and wage rates are higher than in areas where subsistence crops are predominant. Non-farm labor supply in smallholder households micro enterprises and other private and public non-farm sectors is mostly affected by supply factors such as smallholder household skills, and the overall demand conditions in the non-farm labor market.

Table 14. Wage Labor off Own Farm

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Wage Labor				
% of HH with Wage Employment (WE) – R01	19.8	42.9	29.1	26.5
% of HH with Wage Employment (WE) – R02	18.5	25.0	12.2	25.0
Distribution of WE – by Type				
Agricultural	16.1	25.0	23.9	24.9
NonAgricultural	13.2	28.6	12.1	23.4
Location of Wage Employment: Round 01				
Within the Village	84.8	88.2	91.6	75.0
Another Village within the District	12.8	5.9	8.4	25.0
Another District within the Province	0.0	5.9	0.0	0.0
Other Province	0.0	0.0	0.0	0.0
Outside the country	2.4	0.0	0.0	0.0
Location of Wage Employment: Round 02				
Within the Village	65.2	42.9	69.1	79.0
Another Village within the District	31.6	28.5	30.9	21.0
Another District within the Province	0.0	28.6	0.0	0.0
Other Province	0.0	0.0	0.0	0.0
Outside the country	3.2	0.0	0.0	0.0

Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

In this analysis we explore the involvement of members of the different types of smallholder households in wage labor markets, both on and off-farm. Overall, about one fifth of the tobacco growers got some kind of wage employment during the 2003/04 agricultural season. Table 14 shows that, in tobacco areas, wage employment was more common among non-growers. About 42.9% of them report getting engaged in wage labor in the first part of the season when most of the activities took place in tobacco farms. In the final phase of the season that percentage dropped to only 25.0% of nongrower smallholder supplying labor. Like in tobacco growing areas, in cotton areas non-growers have a greater likelihood of getting wage employment in the second period. In the first part of the season the two groups are almost equally likely to get wage labor.

In tobacco growing areas, tobacco growers are more likely to get wage employment in agricultural activities (16.1%) than in nonagricultural activities, while among non-growers wage employment in nonagricultural activities (28.6%) is slightly more likely than in agricultural activities (25.0%). In cotton growing areas, growers of cotton are more engaged in agricultural employment, 23.9% of smallholders than in non-farm employment (12.1%). Non-growers are equally likely to get any kind of employment – 24.9% get agricultural employment and 23.4% get nonagricultural jobs.

Regarding the location of employment, results show that in both areas, employment opportunities shifted from within the village in the first part of the season, to outside the village in the later part of the season. That is particularly true for both types of farmers in tobacco areas. In cotton areas, non-growers still got a significant part of their opportunities within the village. That may have to do with the fact the cotton harvesting and marketing extends to a considerable part of the second period, and wage employment opportunities were still available. Wage labor outside the district is not common. Looked at in combination with results in previous sections, this leads to the conclusion that international labor migration in the Zambezi Valley is predominantly "one way" – from Malawi to Mozambique.

5.9. Cutting and Planting of Trees

Experiences from many countries indicate that environmental management plays a key role in determining the long-term sustainability of cash cropping sectors such as tobacco and cotton. Environmental issues in this context refer more specifically to soil erosion and loss of fertility, as well as deforestation. The survey questioned farmer about the cutting of trees for both area expansion and for other reasons, and tree planting habits among smallholders. In each round questions were related to the relevant time period, and picked up on the incidence of events and the number of trees involved. Table 15 summarizes the aggregate results and Figures 27 to 32 break down those results by time period.

The results here should be looked with caution. First, when asking about tree cutting and planting in the first round of the survey, we wanted to capture events between September/03 and February/04, and not necessarily all the trees cut to plant the areas reported for the 2003/04 season. Although careful training was done to make that clear, it is possible that some numbers collected did pick up on months prior to that. Second, the events on tree cutting for area expansion reported for the period March/04–August/04 are clearly related to the opening of new areas for the 2004/05 season. With this in mind, it is clear that we cannot make a straight conclusive analysis using the land area data collected in this survey and the cutting and planting of trees information.

In Table 15 we find that over 60% of tobacco growers and about half of the cotton growers report cutting some trees at some point during the 2003/4 season. Only about a third of non-growers in both cash cropping areas report doing so. Figure 27 shows that more smallholders report cutting trees in the second period, i.e., after the harvesting and before land preparation in 2004. On the aggregate, the number of trees cut is higher among those cash crop growers, but when one looks at each period individually, which may be picking up different sets of smallholders, the average number are higher in tobacco growing areas (growers and non-growers) than in cotton growing areas – see Figure 28. Overall, as expected the less deforestation, in terms of trees cut for area expansion, is brought by non-growers in cotton areas.

Table 15. Cutting and Planting of Trees by Smallholder Households

	Tobacco Areas		Cotton Areas	
	Growers	Non-growers	Growers	Non-growers
Cutting of Trees for Land Area Expansion				
% of Farmers Cutting	61.5	32.1	49.3	35.9
Mean Number cut among those cutting	691.1	368.7	636.8	111.8
Mean Number cut among all	425.3	118.5	313.8	40.1
Uses of wood from Land Area Expansion Cutting				
Cutting of Trees for Other Reasons				
% of Farmers Cutting	75.2	50.0	62.7	68.7
Mean Number cut among those cutting	232.2	115.4	124.9	200.7
Mean Number cut among all	174.6	57.7	78.4	138.0
Other Reasons for Cutting Trees				
Planting of Trees				
% of Farmers Planting Trees – among all	32.6	10.7	17.6	18.7
Mean Number among those planting	177.1	139.1	10.7	11.1
Mean Number of trees planted – among all	57.7	41.9	1.9	2.1
Sources of Seedlings (% w/ source) – Round 01				
Personal source	34.8	0.0	60.0	100.0
Purchased	0.0	0.0	20.0	0.0
Received from Firm	50.8	100.0	8.9	0.0
Received from DDA	5.2	0.0	11.1	0.0
Received from NGO	0.0	0.0	0.0	0.0
Other Sources	9.3	0.0	0.0	0.0
Sources of Seedlings (% w/ source) – Round 02				
Personal source	16.4	100.0	56.7	100.0
Purchased	5.9	0.0	16.5	0.0
Received from Firm	77.7	0.0	0.0	0.0
Received from DDA	0.0	0.0	13.4	0.0
Received from NGO	0.0	0.0	0.0	0.0
Other Sources	0.0	0.0	13.4	0.0

Fonte: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

When it comes to cutting trees for other reasons, the percentages are generally higher, with tobacco growers still being one of the most important groups – about three quarters report doing so. Half of non-growers in tobacco areas, 62.7% of cotton growers, and close to 70% of non-growers in cotton areas cut trees for other reasons. Such reasons include uses for firewood, barn construction, tobacco treatment, house building, etc. In terms of the number of trees cut, tobacco growers and non-growers of cotton appear as the groups that cut more trees – an average of over 150 trees across all farmers, or 200 trees, when only cutters are accounted for. Figure 30 shows that, for all smallholder groups, most of the tree cuts happened in the September/03 – February/04 period, most likely between September and November/03.

Reforestation is an issue that has been increasingly discussed in Mozambique, particularly with respect to areas where growth in cash crops, particularly tobacco, is taking place. In tobacco growing areas where this study took place, companies have set up forestry divisions and are placing reforestation programs in place. In many areas where MLT and DIMON operate, farmers have received seedlings. A Government commissioned study to help guide a reforestation strategy is currently underway in tobacco growing areas.

Results from our surveys indicate that about a third (32.6%) of the tobacco growers planted some trees during the 2003/04 agricultural season. That compares with 10.7% of non-growers in those same tobacco areas, and about one fifth among growers and non-growers in cotton areas. Tobacco growers usually plant many more trees than any other group – on average each farmer (among those that plant) plants 177 trees, which compares to 139 trees among non-growers of tobacco in tobacco growing areas, 10 among cotton growers, and 11 among non-growers in cotton areas. Most of the tobacco growers obtain their seedlings from the company that provides the inputs for tobacco production while a few others get them from personal sources. Among other types of farmers, personal sources are the most important way of getting the seedlings. For more details see Table 15.

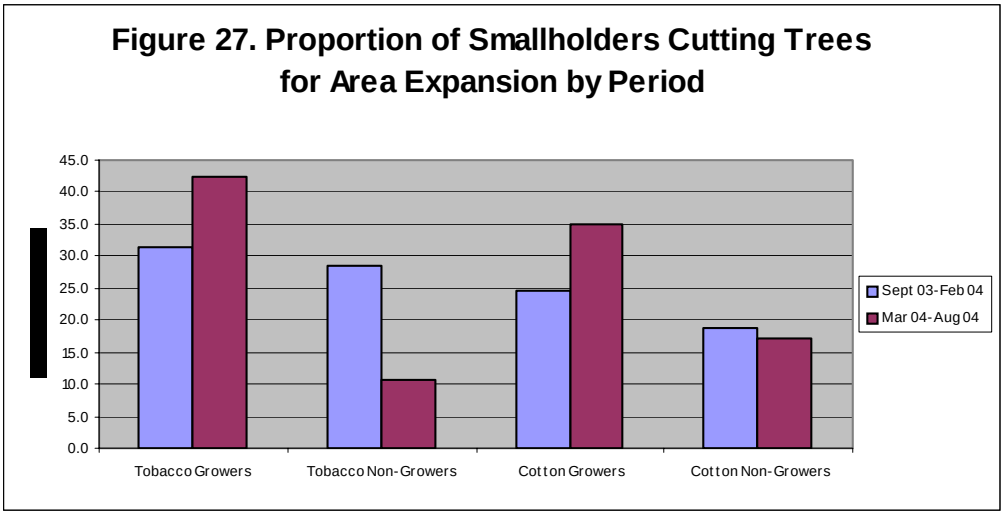


Figure 28. Mean Number of Trees Cut for Area Expansion by Period
(among those cutting)

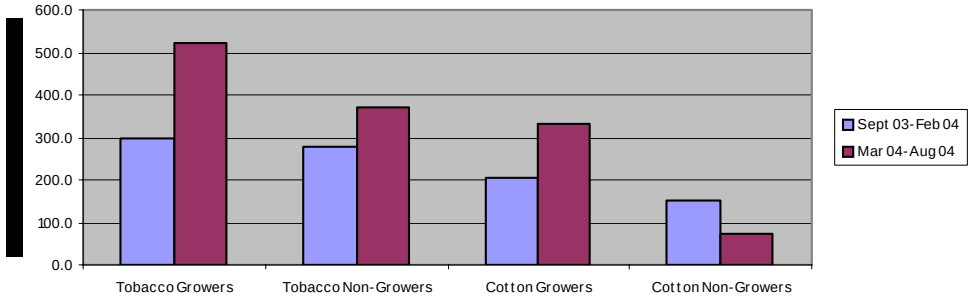


Figure 29. Proportion of Smallholders Cutting Trees for Other Reasons by Period

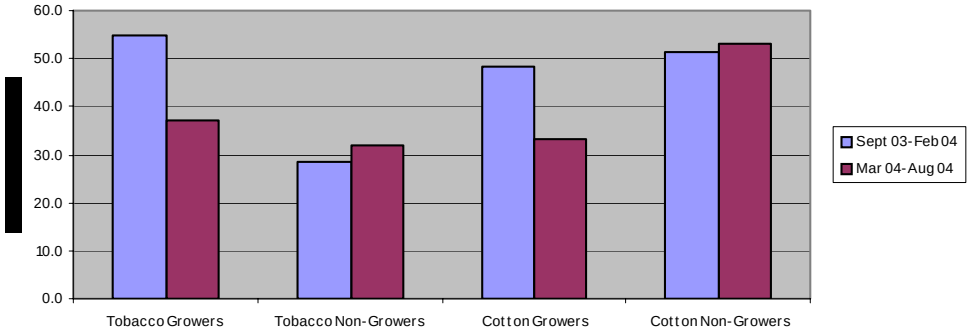
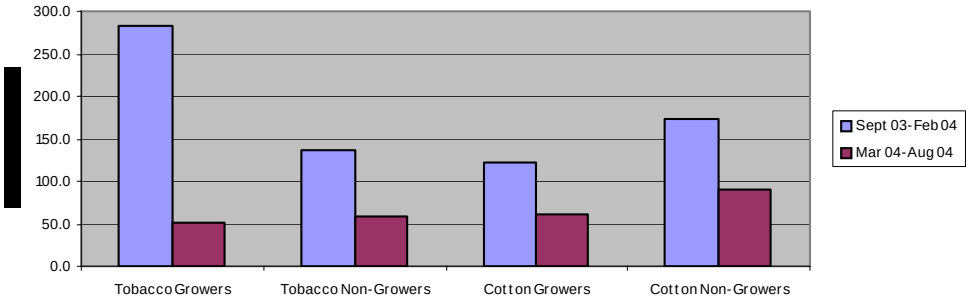
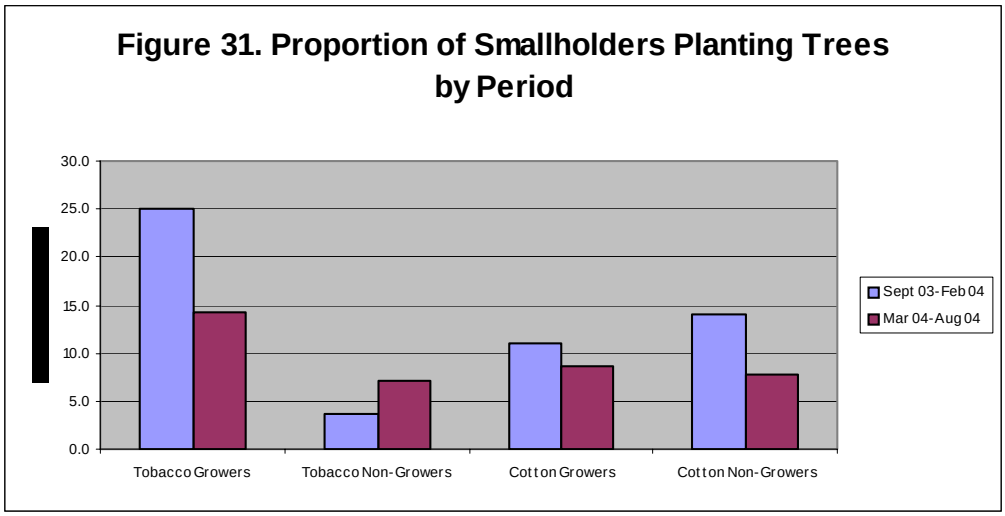
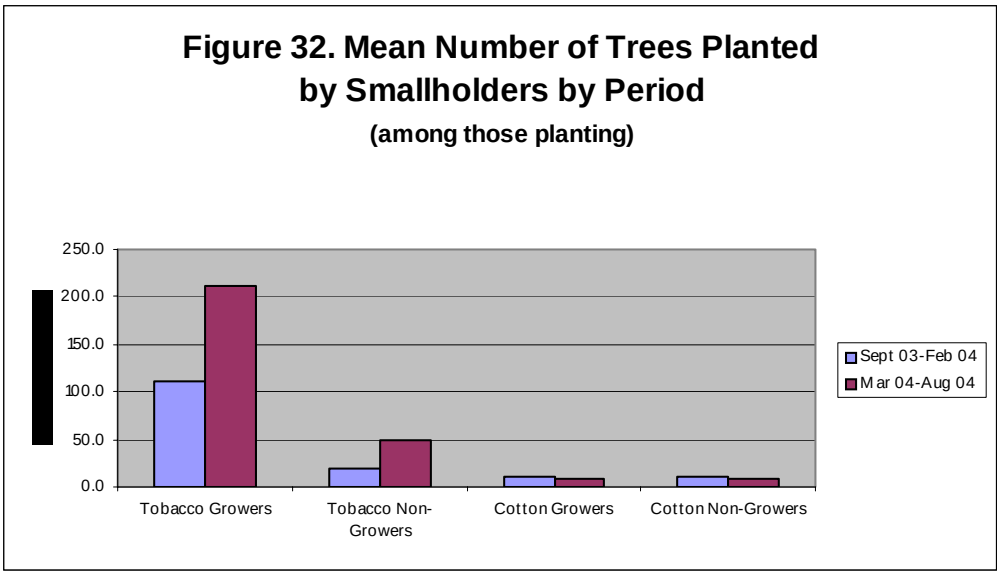


Figure 30. Mean Number of Trees Cut for Other Reasons by Period
(among those cutting)







5.10. The Profitability of Cash Crop Production

In this section, we look at smallholder household profitability in cash crop production. We use data provided by the contract farming firms for the sampled farmers regarding the volumes purchased and the cost of nonlabor inputs. The information collected in the survey regarding area cultivated, household composition, and labor use is added to that to construct simple farm budgets, and under take quartile analysis on selected dimensions, such as yield and net gain per farmer.

5.10.1. Tobacco Smallholder Farmers

The analysis of tobacco grower profitability is presented in Table 16, where producers are divided in yield quartiles. Yield levels range from about 100 kg/ha in the lowest quartile to about 1,277 kg/ha in the highest quartile. Average yield across all sampled smallholders was about 530 kg per hectare. This yield is considerably lower that in previous seasons. Evidence collected during the survey indicates, that in some areas, weather conditions, particularly rains, had an adverse impact on tobacco production.

On average each grower produced about 1.5 tons of tobacco and was paid an average price of $0.80 per kilogram. Smallholders in the highest yield category produced over 2.8 tons of tobacco for a gross revenue of about $2,000. The average farmer pays back a credit of just over about $360 for nonlabor inputs and gets a cash receipt of over about $760 before paying hired labor. The net gain per tobacco grower after paying for the hired labor is close to $300.

In general, gains increase with yield. The lowest yield households have significant losses, while highest yield households achieve a net gain over $800. All the other indicators follow that same increasing trend. Figure 33 shows how the different components in the calculation of gross revenue, cash received, and net gains vary with yield quartiles.

To have a better idea about the distribution of gains in the tobacco sector in the Zambezi Valley, we divided the households in quartiles of net gain. Results indicate that households that have the lowest incomes (net gains) have significantly high labor costs and low production volumes/values. Part of these households may have been adversely affected by other factors during the course of the season. High income households appear to have used hired labor moderately, and relied to a great extent in family labor and a careful management of the crop. Locational factors that condition the effects of weather factors may also have played a positive role. This analysis shows that the 25% of the highest yield households reach on average net profits well over $1,000 per year. For these results see Figure 34.

Table 16. Crop Budget by Yield Quartile in Tobacco Smallholder Farms

Variable	Unit	Yield quartiles				Total
		1	2	3	4	
Mean yield	kg/ha	97.23	269.83	472.85	1,276.91	528.71
Area cultivated with tobacco	ha	2.70	2.43	4.46	2.41	3.00
Quantity of tobacco Produced	kg	256.16	646.94	2,041.97	2,782.25	1,430.34
Gross revenue	$US	201.72	605.33	1,648.17	1,983.04	1,108.61
Average price received	$US/kg	0.65	0.94	0.83	0.77	0.80
Cost of nonlabor inputs	$US	98.85	258.95	575.01	489.40	355.37
Cash received	$US	102.87	346.38	1,073.16	1,493.63	753.24
Cost of hired labor	$US	370.05	316.65	643.35	582.76	477.90
Net revenue	$US	-267.18	29.73	429.81	910.87	275.34
Mean family labor days		146.18	187.99	201.97	209.86	186.40
Net revenue/hectare	$US/ha	-78.60	28.92	125.61	521.30	149.08
Net revenue/adult		-105.94	14.30	199.50	319.41	106.04
Net revenue/family labor days		-2.01	-0.09	4.72	7.65	2.55

Note: This analysis only uses cases with a complete set of data.
Source: Firm data, survey data, and authors´calculations.

Figure 33. Tobacco Smallholder Profitability by Yield Quartile

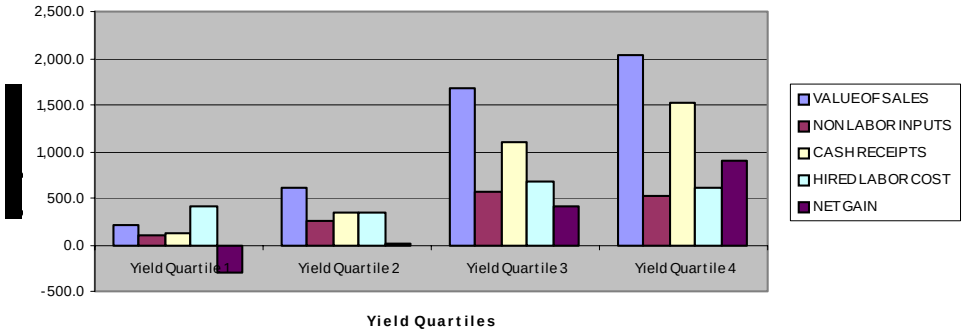
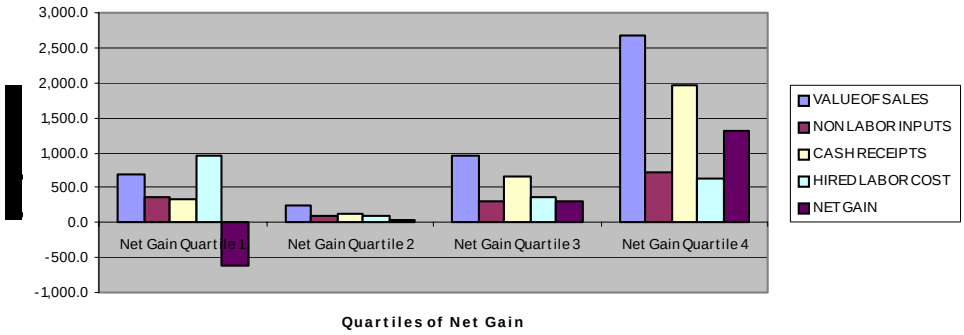


Figure 34. Tobacco Smallholder Profitability by Quartiles of Net Gain



5.10.2. Cotton Smallholder Farmers

As compared with tobacco smallholders, cotton growers appear to have a much lower level of activity. Cultivated areas are significantly smaller and the average amounts of money used for nonlabor inputs and payments to hired labor are also much lower. The results for cotton growers are present in Table 17 and Figures 35 and 36.

The average quantity of cotton produced is considerable higher among high yield smallholders. As expected, given the price setting mechanisms in this sector, computed farm gate prices do not vary across the different groups – on average, each farmer receives $0.20 per kilogram of cotton sold to concession companies.

The net returns are also significantly lower – on average cotton farmers get just more than $80 per year after paying for their inputs including labor. The level of net gains increases with yields, ranging from losses of over $20 in the lowest quartile to an average net gain of over $200 in the highest yield quartile. Figure 36 graphically presents the different components in the calculation of net gains by net gain quartile. The analysis indicates that lowest quartile smallholders have significant losses, and highest quartile households have profits that are relatively high but in absolute terms are just over $300 per year.

Table 17. Crop Budget by Yield Quartile in Cotton Smallholder Farms

Variable	Unit	Yield quartiles				Total
		1	2	3	4	
Mean yield	kg/ha	183.1	419.6	662.2	1175.3	608.5
Area cultivated with cotton	ha	1.2	1.4	1.7	1.6	1.5
Quantity of cotton produced	kg	235.0	574.3	1070.6	1881.5	937.7
Gross revenue	$US	54.30	131.50	243.0	409.10	209.00
Average price received	$US/kg	0.20	0.20	0.20	0.20	0.20
Cost of nonlabor inputs	$US	8.50	17.70	24.40	47.40	24.40
Cash received	$US	45.80	113.80	218.60	361.60	184.50
Cost of hired labor	$US	73.30	67.30	109.70	149.00	99.60
Net revenue	$US	-27.50	46.50	108.90	212.70	85.00
Mean family labor days		130.9	95.4	115.4	181.4	130.6
Net revenue/hectare	$US/ha	-23.40	7.90	65.30	129.90	44.80
Net revenue/adult		-8.90	19.30	47.40	79.40	34.40
Net revenue/family labor days		-0.10	0.70	1.20	1.50	0.80

Note: This analysis only uses cases with a complete set of data.
Source: Firm data, survey data, and authors´calculations.

Figure 35. Cotton Smallholder Profitability by Yield Quartile

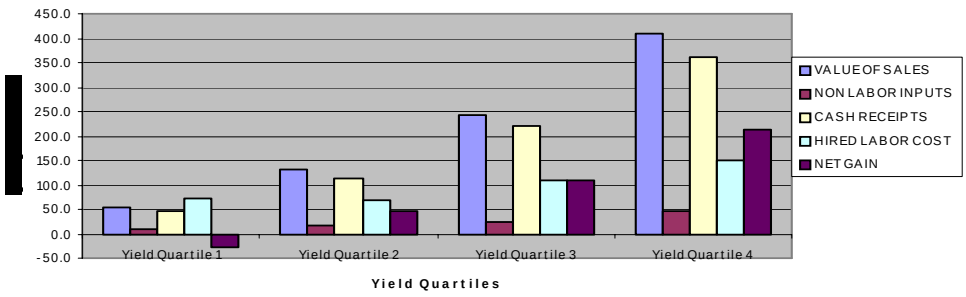
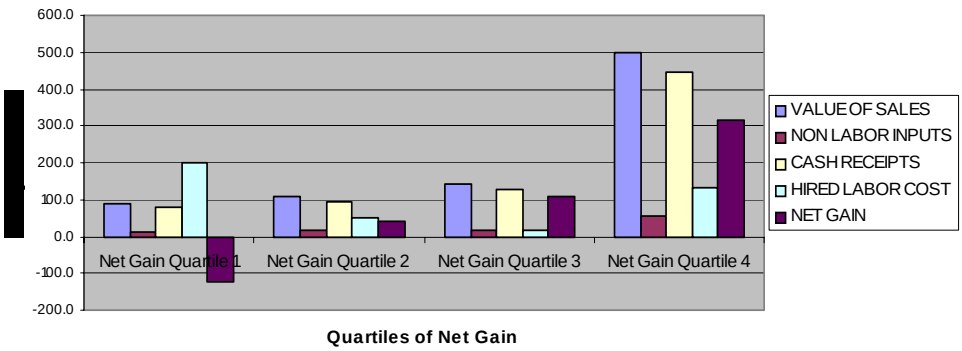


Figure 36. Cotton Smallholder Profitability by Quartile of Net Gain



5.11. The Structure of Smallholder Household Income

In this section we look at the structure of smallholder household income. Using data collected in the survey, we computed a measure of total household income and income per capita. In Table 18, total household income is presented by component in $US. Total income is dis-aggregated in crop income that includes food crop production and major cash crop production (cotton and tobacco), livestock income (consumed and sold), MSE/self-employment income, wage labor, net remittances, and pensions. The last line of the table presents estimated per capita income levels by smallholder type. Table 19 presents the structure of total income in percentage terms.

Table 18. The Structure of Smallholder Income in the Zambezi Valley, by Type ($US)

Income Sources	Household Income Components, Total Income and Income per capita, by Area and Farmer Type			
	Cotton Areas		Tobacco Areas	
	Non-growers	Growers	Non-growers	Growers
	------- in $US per Household -----			
Agricultural Income	472	548.1	760.6	1,107.7
Food Crops	472.0	465.4	760.6	811.7
Retained Food	423.6	440.0	656.8	759.5
Sales of Food	48.4	25.5	103.8	52.2
Cash Crops: Tobacco or Cotton	0.0	82.7	0.0	296.0
Livestock Income	77.2	86.5	95.9	86.3
Self-Employment Income	63.8	29.8	62.3	77.5
Wage labor	59.5	43.6	126.5	80.3
Remittances (Net received)	-7.4	-16.0	-32.2	-40.2
Received	18.0	10.5	14.1	11.0
Sent	25.3	26.5	46.3	51.2
Pensions	0.0	63.6	96.8	25.5
Total Household Income	665.1	755.6	1109.8	1337.1
Household Income per Capita	118.8	128.1	198.2	222.9

Source: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

Results in Table 16 indicate that, overall, tobacco growing households enjoy the highest incomes per capita in the study area. Smallholders in cotton areas enjoy relatively lower incomes. A surprising result in this study, that requires further investigation, is related to the fact that, on average, nongrower smallholders in tobacco growing areas have incomes that are higher than cotton growers. A closer look at Tables 18 and 19 reveals that the source of that difference stems from significantly higher food crop production and sales, and much higher wage labor income

that non-growers in tobacco areas have relative to households in cotton growing areas. It is worth noting that growers and non-growers in tobacco areas have similar crop production volumes but non-growers sell a much higher volume. Following the results in previous sections, relatively high volumes of home consumption among tobacco growers is related to the fact that some of the tobacco is supplied to laborers working in their farms. Part of the food crop production sold by non-growers in those areas is also likely to be consumed by those farm workers paid in-kind.

Wage labor income is higher for the two groups of households in tobacco areas. Looking at the areas independently, one finds that non-grower households have higher wage labor incomes. Table 19 shows that the same is true for self-employment income, although in absolute terms, tobacco growing households have a higher average micro-enterprise income than do non-growers. Regarding remittance, it is worth noting that all household groups are net senders of remittances.

Table 19. The Structure of Smallholder Income in the Zambezi Valley, by Type (%)

Income Components	Household Income Components, Total Income and Income per capita, by Area and Farmer Type			
	Cotton Areas		Tobacco Areas	
	Non-growers	Growers	Non-growers	Growers
	------- in % of Total Household Income -------			
Agricultural Income	71	72.5	68.5	82.8
Food Crops	71	61.6	68.5	60.7
Retained Food	63.7	58.2	59.2	56.8
Sales of Food	7.3	3.4	9.4	3.9
Cash Crops: Tobacco or Cotton	0	10.9	0	22.1
Livestock Income	11.6	11.4	8.6	6.5
Self-Employment Income	9.6	3.9	5.6	5.8
Wage labor	8.9	5.8	11.4	6
Remittances (Net received)	-1.1	-2.1	-2.9	-3
Received	2.7	1.4	1.3	0.8
Sent	3.8	3.5	4.2	3.8
Pensions	0	8.4	8.7	1.9
Total Household Income	100.0	100.0	100.0	100.0

Source: Zambezi Valley Cotton and Tobacco Concession Areas Study, 2004.

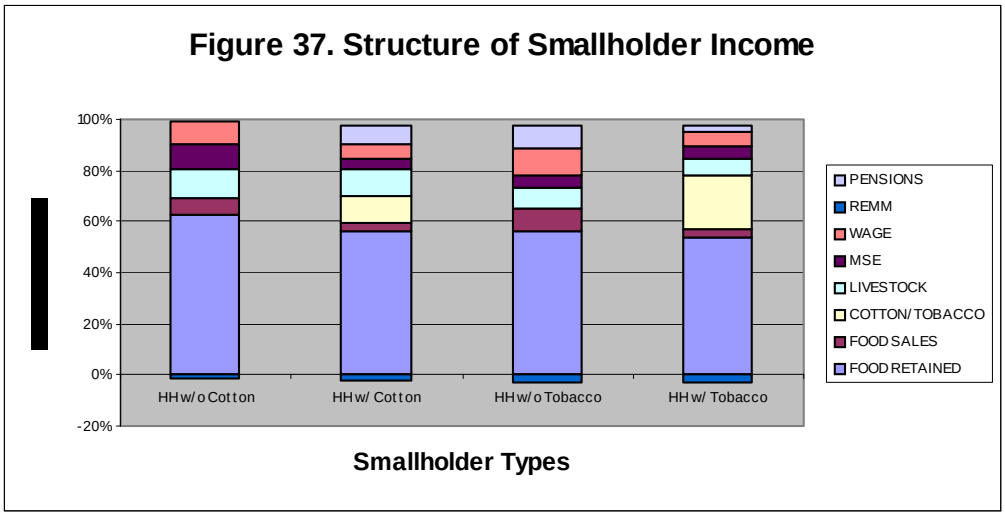


Figure 37. Structure of Smallholder Income
100%
80%
60%
40%
20%
0%
-20%
HH w/o Cotton
HH w/ Cotton
HH w/o Tobacco
HH w/ Tobacco
Smallholder Types
PENSIONS
REMM
WAGE
MSE
LIVESTOCK
COTTON/TOBACCO
FOOD SALES
FOOD RETAINED

6. SUMMARY OF CONCLUSIONS

Using data from a two round survey with 300 smallholder households among growers and non-growers of cotton and tobacco in the Zambezi Valley, this paper presented some preliminary results that help to give a snapshot of the smallholder sector in cash cropping areas of that important development region of Mozambique. The area being investigated includes both tobacco growing areas, where MLT and DIMON operate, as well as areas were cotton concessions companies such as DUNAVANT (Tete) and CNA (Northern Sofala) operate. The paper explores in great detail issues related to household factor endowments – family labor, land and assets – and the portfolio of activities that smallholder chose to get engaged in between crop production (food and cash), labor market participation and self employment activities. By breaking the analysis in the relevant representative farm types in each area (growers and non-growers of the respective cash crops), the analysis allows for an initial look at how those economies are evolving and may react to exogenous shocks. It is worth noting, however, that all the analysis here is purely descriptive.

A few aspects are worth reviewing here. We are not going to repeat the finding presented in each section, but just emphasize some issues. Although both crops are essentially emerging in the valley in recent years, growth in tobacco has been a lot more stable, with both the number of farmers as the volumes produced and traded on an exponential move.

In both cotton and tobacco areas, female headed households have less access to those cash crops, and wage labor opportunities are more accessible for men that women. Furthermore, results suggest that while underage labor occurs with some frequency within the family, hiring underage labor for a wage in farm and non-farm activities is not common at all, with the exception of an insignificant number of permanent laborers working in tobacco farms. An analysis of access and school attendance by household type suggests that cash cropping households are less likely to have school aged children in school, but those in school are more likely to miss school than those in noncash cropping households.

Regarding access to land, we find that the great majority of smallholders in all areas get the land through nonmarket ways. Access through traditional authorities, free occupation, and inheritance are the most common ways. Land renting or purchasing is seemingly nonexistent. While in tobacco areas cash cropping smallholders put a larger amount of land into the cash crop relative to other crops, in cotton growing areas, maize area among growers is higher than that for cotton. In each area, non-growers put a significant level of effort in maize production. In tobacco growing areas, we find that a significant amount of that maize is marketed and very likely used for in-kind payments in the very active labor market. While over fifty percent of smallholder in tobacco areas and over a third in cotton areas grow other crops such as groundnuts, beans, and vegetables, its marketing is rather limited. The use of animal and mechanical traction is still limited in the study area. With respect to the use of chemical inputs, we find that while in tobacco areas it extends beyond cash crop growers, in cotton growing areas it is exclusively used by cotton growers linked to contract farming schemes. Fertilizer use is only limited to farmers in tobacco growing areas where they apply it in tobacco, maize and vegetable crops. The emergence of open markets for those chemical inputs appears more promising in those tobacco growing areas. In tobacco growing areas, we found that contract farming firms are heavily recommending farmers to follow crop rotation practices to minimize the effects of soil degradation and increase food crop production.

In analyzing the dynamics of labor markets, we found that it is much more active in tobacco growing areas. A significant number of households in those areas sell and buy labor for cropping activities. Furthermore, research indicates that a significant number of permanent laborers, over half of those hired among farmers that hire, come from Malawi. While that poses questions about the potential "leakages" in the tobacco boom, one cannot ignore the fact that that labor force has played a very important role in making possible that expansion. Furthermore, the increased demand for food unleashed by the payment mechanisms instituted generates more benefits in the local economy. An analysis of the structure of employment by crop shows that while family labor is very common in all fields (tobacco, cotton and maize), permanent labor is widely used in tobacco fields (29% of the total labor used), moderately used in maize fields (13%), and not important in cotton fields (only 2%) where temporary labor is relatively more important. In terms of labor demand, tobacco demand a lot more labor, but a significant part of it is satisfied through the labor market, while family labor undertakes a larger share in cotton fields.

Income diversification into self-employment activities is common in both areas. In tobacco growing areas, cash crop growing and nongrowing households are equally likely to get engaged in such activities, while in cotton growing areas non-growers are slightly more likely to do so. In general, the MSE (Micro and Small Enterprise) sector is dominated by one person businesses, and are dominated by trading and manufacturing activities. Diversification into wage labor activities is generally more likely among noncash cropping households. In the first half of the season, such employment is predominantly within the village itself, but later on the season, opportunities outside the village seem to grow.

Cutting and planting of trees is an important issue. Research results indicate that, cutting of trees, both in frequency and in numbers, is more evident in tobacco growing areas. This seems to suggest that a great deal of the increase in tobacco production has been done through area expansion and the opening of new fields by new entrants. Tobacco growers are more likely and tend to cut more trees than any other group. One encouraging result, however, is tobacco growers (over half of them) are also more likely to plant a larger number of trees. All tobacco firms in the area are currently engaged in reforestation programs. A Government study is also underway to find the best way to generate a positive intervention in the re-forestation front.

Using detailed farmer field level data, we analyzed the profitability of cotton and tobacco farmers. In this process, we estimated crop budgets for each crop. The analysis shows that overall tobacco production is more profitable in net terms. An analysis by yield quartile, shows that for both crops net gains grow with yield. While lowest yield quartile households have a net loss, high yield households have significantly higher gains, particularly in tobacco. An analysis by quartile on net gain indicates that there is a wide variation in the distribution of costs and benefits in both crops.

We finalize the analysis with an analysis of the structure of smallholder household income. Results in this study suggest that incomes per capita are higher among tobacco growers, followed by non-growers in those areas. Incomes per capita among cotton growers are just slightly higher than non-growers in the cotton areas, and are much lower than that of non-growers in tobacco areas. Food crop production and marketing, as well as much higher labor market incomes appear to explain those differences. This result merits further investigation.

As previously indicated the aim of this report was just to present some initial findings that will be used to substantiate additional analysis aimed at investigating further interaction in the economy using regional economy wide models.

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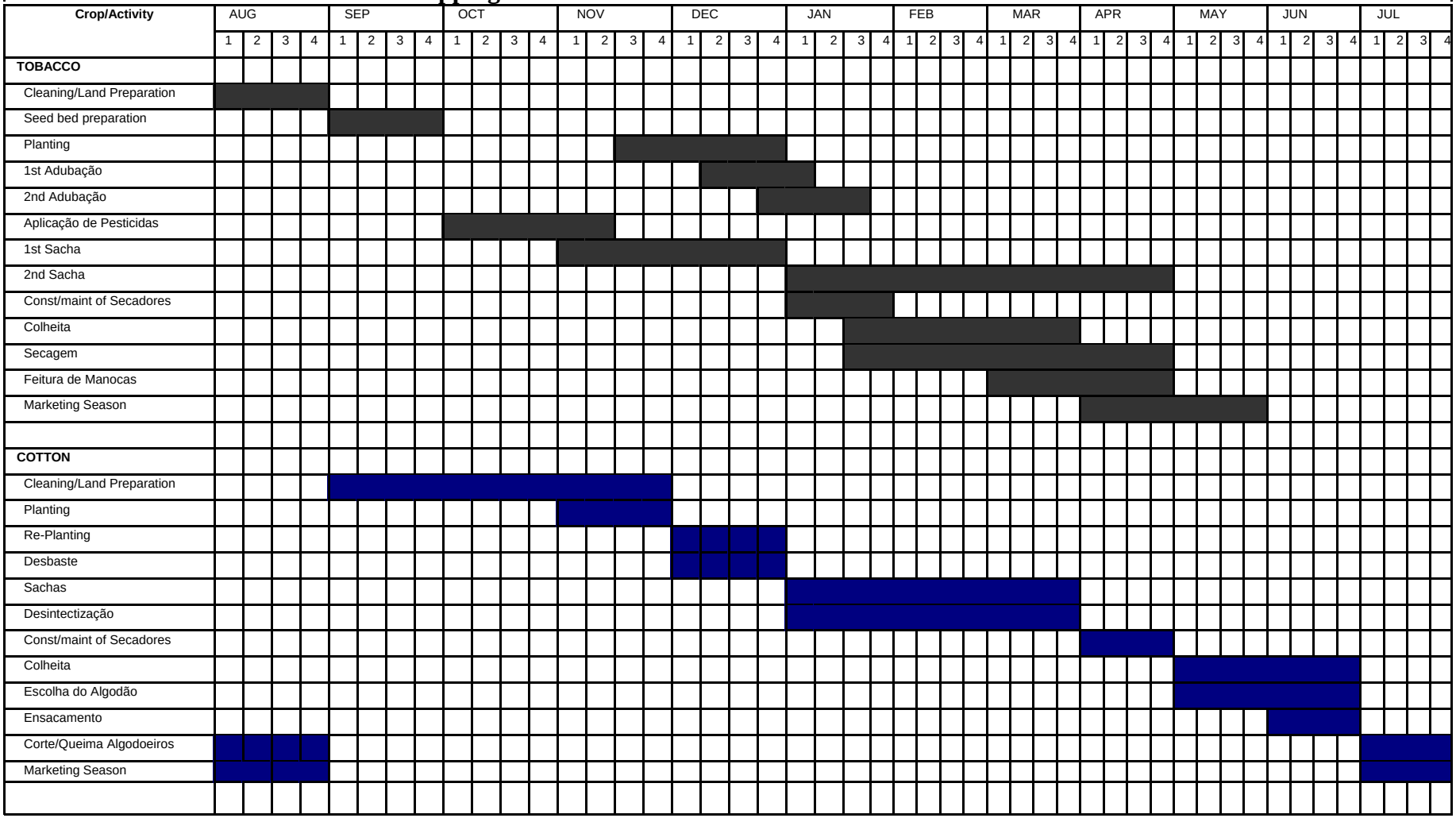
Annex 1. Cotton and Tobacco Cropping Calendars



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