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EXECUTIVE SUMMARY

The ability of agricultural policy makers to promote national development objectives requires an accurate and reasonably current picture of what crops farmers grow, what they eat, the importance of various crops in their incomes, and how they spend their money. In Zambia's case, there is reasonably accurate information on production levels and trends in a specific set of crops grown by smallholder farmers, but very little knowledge of how important these specific crops are in smallholders' total crop incomes, the importance of crop production in total smallholder incomes (which include livestock and non-farm activities), and how changes in crop prices affect smallholders' welfare.

This paper presents a comprehensive picture of crop production and marketing patterns in Zambia's small- and medium-scale farm sector, examines how these patterns vary regionally, and examines differences between poor and non-poor strata of the rural farm sector. The data presented comes from the 1999/00 and 2002/03 production years, corresponding to the 2000/01 and 2003/04 marketing years. Because so much policy attention in Zambia is focused on maize, the study provides a particular emphasis on small farmers' maize production and marketing behavior, and discusses their implications for policy.

Crop production (including crops retained on the farm plus crops sold) accounted for 69.1% and 72.5% of total household income in the 1999/00 and 2002/03 crop years. Income from animal product accounted for 2.8% and 5.1%, while off-farm activities accounted for 27.7% and 21.7% of total household income. The cereal crops (predominantly maize, but also sorghum, millet, and rice) accounted for 38.3% and 35.1% of total household income in the two seasons. Roots and tubers accounted for 14.2% of total household income in 2000/01 and 17.7% in 2003/04.

The value of cassava production is about 40% to70% the value of maize production. There was an increase in production of 71% between 1992 and 1998 in the northern province alone. The bulk of this cassava is grown in the northern, more rainfall abundant part of the country. The increase can be attributed to advances in productivity through the introduction of early maturing, pest resistant varieties. In addition, the withdrawal of maize price supports may have led farmers to diversify their energies to a crop that is suited to the agroecological conditions in the northern part of the country, which is cassava. An unanswered question concerns how the recent re-introduction of maize price supports (including pan-seasonal and pan-territorial pricing) and fertilizer subsidy programs will affect the growth in cassava production.

While maize remains the dominant crop in production, income from crop sales are considerably more diversified. In particular, there appears to be a great rise in smallholder revenue from the sale of fresh fruits, vegetables, and non-food cash crops. In both the 2000/01 and 2003/04 marketing years, horticultural crop sales were roughly equivalent to the value of maize sales nationwide. Sales of animals and animal products are also shown to account for a substantial portion of sales revenue in the smallholder farm sector, accounting for about 50% to 75% as much sales revenue as that generated from maize sales.

The emergence of cotton and tobacco over the three years is also noteworthy. The combined value of cotton and tobacco sales was less than that of maize in 2000/01, but exceeded the value of maize sales in 2003/04. Livestock product sales also appear to have risen dramatically between 2000/01 and 2003/04, accounting for over US$33 million in the latter year. With supportive policies and public investments, these crops and animal income

activities could be further expanded in the small-scale farm sector and could prove to be an important engine for poverty reduction in rural Zambia.

There are significant regional variations in the composition of crop production and sales. In the high-rainfall areas in northern Zambia, sales revenue from fresh fruits and vegetables exceed that from either maize or cassava. In the north, a shift from maize to cassava has been well recognized, but there appears to have been a largely unrecognized shift in production and sales from maize to fresh fruits and vegetables. Maize production in the more remote northern areas of Zambia has become less attractive after the withdrawal of NAMBOARD (and other subsequent government organizations) pan-territorial support prices, and the reduction in the volume of subsidized fertilizer distributed through government programs (which were primarily used on maize). This may change if recent high levels of government purchases of maize at above-market prices continue. In the lowest rainfall zone of southern Zambia, income from animal production is relatively large, accounting for over 25% of gross farm sales revenue in both 2000/01 and 2003/04. In the middle rainfall belt, cotton, tobacco, and other non-food cash crops accounted for 33% to 50% of total gross revenue among smallholder farmers.

At the household-level, there is a strong positive correlation between households' net maize sales, household income, landholding size, value of other crop production, off-farm incomes, value of farm assets, and education levels. After ranking all households from low to high income, those in the top income tercile are generally sellers of maize, while households in the bottom income tercile are buyers of maize. Nationwide, roughly 17% and 20% of the smallholder households in Zambia sold maize in 2000/01 and 2003/04. Another 5% of these farm households bought and sold maize, but were net sellers. Roughly 35% of the smallholder households nationwide only purchased maize or maize meal, while another 3% both bought and sold, but purchased more than they sold. Contrary to conventional beliefs that many smallholder farmers sell grain after harvest and buy back grain later in the season, only about 8% sell and buy back maize according to data from the two seasons.

About 40% to 45% of the total marketed supply of maize from the smallholder farm sector was produced by only 2% of the smallholder farms, indicating a very high concentration of the marketed surplus. The facts that household maize sales are correlated with income and wealth and that more farm households are buyers or net buyers of maize than sellers imply that the majority of small-scale farm households may be adversely affected by price and trade policies designed to raise market prices of maize, and that these policies might have anti-poor distributional consequences.

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CF	Crop Forecast
CFS	Crop Forecast Survey
CSO	Central Statistical Office
FAO	Food and Agricultural Organization
FRA	Food Reserve Agency
FSRP	Food Security Research Project
GRZ	Government of the Republic of Zambia
MACO	Ministry of Agriculture and Cooperatives
MMD	Movement for Multiparty Democracy
NAMBOARD	National Agricultural Marketing Board
PHS	Post-Harvest Survey
SEA	Sample Enumeration Areas
SS	Supplemental Survey
SIDA	Swedish International Development Agency
UNIP	United National Independence Party
USAID	U.S. Agency for International Development

1. INTRODUCTION

Effective agricultural and food security policies in Africa depend on an accurate and reasonably current picture of what crops small farmers grow, the importance of different crops in their production and income portfolio, and whether they are buyers or sellers of particular food crops. Policy makers' views on how agricultural policies and programs are working, and how they should be modified, rely on available agricultural statistics and trends compiled by the country's national statistical agencies. In Zambia, policy makers' perceptions about how best to promote small farmer welfare are based on the Crop Forecast (CF) and Post-Harvest Survey (PHS). The Central Statistical Office (CSO) under the direction of the Ministry of Agriculture and Cooperatives (MACO) conducts these surveys annually.

These surveys generally track a partial set of commodities (maize, sorghum/millet, oilseed crops, beans, and tobacco, and more recently cassava and sweet potato). Other crops, notably fruits and vegetables, and production of animal products are generally not included. Moreover, policy makers' understanding of the small farm sector has been generally limited to crops that farmers grew and sold, not what they purchased. Neither the Crop Forecast Survey (CFS) nor PHS provide information on households' food expenditure behavior or income levels.

This partial view of small farmer conditions as depicted in the CFS and PHS surveys needs to be widened to give a more comprehensive view of the food production and marketing patterns of small farmers, how the farmers are affected by price-altering marketing and trade policies, and whether government support is focused on the commodity value-chains that offer the greatest potential to promote smallholder productivity growth and food security.

Fortunately, two recent nationally-representative surveys have been conducted in Zambia to provide a more complete assessment of smallholder conditions, with a view toward providing a comprehensive foundation for understanding the effects of alternative food marketing and trade policy options. In 2001 and 2004, the CSO, under the direction of the Ministry of Agriculture with support from the Food Security Research Project (FSRP), designed supplemental surveys covering the same nationwide sample of roughly 7,000 households as in the 1999/00 PHS. These Supplemental Surveys (SS) covered the 1999/00 and 2002/03 cropping seasons and the 2001/02 and 2003/04 marketing seasons,[1] and were designed to provide an up-to-date picture of smallholder circumstances that links together information on crop production, sale and purchase patterns, household income, and other characteristics that can provide a reliable picture to guide policy makers' decisions. For example, recent discussions for the need of an import tariff on maize are based on the idea that most small farmers derive income from the sale of maize, and, therefore, would be hurt by trade policies that encouraged maize imports. As reported later, this conventional wisdom is incorrect; in fact, most small farmers, and especially the poor, are buyers or "net buyers"[2] of maize, and most likely will be hurt by policies that raise food prices. There are a number of other important facts about small farmers' production and marketing behavior that have major implications for agricultural policies and poverty reduction programs in Zambia.

[1] For example, the 1999/00 crop season refers to crops planted in late 1999 and harvested in April-May 2000, while the corresponding marketing year covers the period May 2000 to April 2001.
[2] "Net buyers" refers to households that both buy and sell, but buy more than they sell throughout the marketing year.

The objective of this study is to provide a comprehensive picture of crop production and marketing patterns in Zambia's small- and medium-scale farm sectors, to examine how these patterns vary spatially, and to examine differences between poor and non-poor strata of the rural farm sector. Because so much policy attention in Zambia is focused on maize (e.g., the bulk of the government's budget allocation to the agricultural sector is devoted to the inputs into maize production and marketing), the study provides a particular emphasis on small farmers' maize production and marketing behavior, and discusses their implications for policy.

2. DATA AND METHODS

Most agricultural production estimates in Zambia are derived from the PHS, conducted annually by the national CSO. The PHS covers a consistent set of crops annually since the 1990/01 crop season (Zulu et al. 2000). The PHS is based on a sample frame of about 8,000 small-scale (0.1 to 5.0 hectares) and medium-scale farm households, defined as those cultivating areas between 5 to 20 hectares. About 86% of the farms in this nationally-representative survey are in the small-scale (0.1 to 5.0 hectares) category. For ease of citation, the full sample of both categories is referred to as the "smallholder" sector.

A major limitation of the PHS is that it excludes crops that have risen dramatically in recent years, such as fresh fruits, vegetables, and animal products. It is likely that official production estimates increasingly underestimate true agricultural output to the extent that smallholders' agricultural activities are increasingly dissimilar to the set of crops covered in the PHS from 1990/91 onward.

Results in this study are derived from the nationally representative PHS and two SS to the PHS in 2001 and 2004. The SS involved revisiting the same rural households that were interviewed in the 1999/00 PHS with a set of "supplemental" questions, which are not normally asked in the regular post-harvest surveys. These questions pertained to land access, production of a wider range of crops than those typically contained on PHS, such as fruits and vegetables, information on non-farm and animal product income, and household socio-demographic characteristics. The first SS was conducted in May 2001 ands the second SS was conducted in May 2004.

The PHS/SS uses a sampling frame of about 8,000 small-scale (cultivating 0.1 to less than 5.0 hectares) and medium-scale farm households (cultivating between 5.0 and 20.0 hectares). About 96% of the farms in these nationally representative surveys are in the small-scale (0.1 to 5.0 hectares) category, with the mean area per small-scale farm being 1.4 hectares. About 4% of the farms are in the "medium-scale" category. For ease of citation, the full sample of both categories is referred to as the "smallholder" sector. See also Annex Map 1 for a display of the CSO sample enumeration areas (SEA) used and the agroecological zones of Zambia.

Large-scale farmers are not included in this survey. Households were included in the sample only if they were found through initial screening questions to cultivate crops or raise livestock. Because the PHS is an agricultural household survey, by definition, the sample contains no landless households. However, initial village listings to prepare the sample frames for these surveys enumerated all households in these villages. These listings were made available, and the percentage of households who engaged in neither crop nor animal production on their own land was found to be less than 4%. Landlessness is somewhat higher in areas closer to towns, where a higher proportion of households are engaged in exclusively off-farm activities.

A major limitation of the PHS is that it began in the 1990/91 season, and therefore is not able to examine trends in the 1970s and 1980s and how this compares with more current production patterns. FAO production statistics are available for these earlier periods, based largely on the national CF estimates, but the CF production estimates are considered a highly unreliable indicator of smallholder production trends for several reasons. First, the CF estimates include production estimates from the large-scale farm sector. It is likely that large-scale farm production has declined for many crops over the past three to four decades, thus making it difficult to detect possible different trends in the smallholder farm sector over

this long period. Second, the CFs are based on impressions of national extension workers rather than statistically valid surveys of farm smallholder households like the PHS. Third, the CFs are based on a set of crops that were dominant in production patterns in the 1970s, which may not match well with smallholder production patterns in the 1990s and 2000s. Because of important shifts over time in cropping patterns, the lack of coverage of certain crops in earlier periods that are known to be important now, and the inclusion of large-scale production in earlier CF estimates, it is potentially misleading to examine trends in the total value of agricultural output from the 1970s to the present time based on the set of crops that were found to be most important in the 1970s. And even the PHS excludes crops that have risen dramatically in recent years, such as fresh fruits, vegetables, and animal products. For all these reasons, this report focuses on the SS to the PHS, which were implemented in 2001 and 2004, covering the 1999/00 and 2002/03 crop production seasons and the 2000/01 and 2003/04 marketing years.

The crops covered in the SS include the following crops, which are reported in the study in the following categories:

Cereals: maize, millet, sorghum, and rice

Roots/tubers: sweet potatoes, cassava, and Irish potato

Beans/oilseeds: mixed beans, cowpeas, ground beans, groundnuts, sunflower, soybeans, velvet beans, and guinea peas

Non-food cash crops: cotton, Burley and Virginia tobaccos, and coffee

Fruits and vegetables: all fresh fruits and vegetables. However, only horticultural sales were enumerated in the SS, not horticultural crop production

"Other" crops: cashew nut, paprika, sugarcane, and green gum (2003/04 only)

For purposes of valuing crops, prices for each crop were determined by computing province-level median prices among households selling the crop. Prices from the 2000/01 seasons were reflated to 2003/04 terms based on the consumer price index, hence they are directly comparable.

3. INCOME SHARES

Table 1 reports smallholder income shares over the entire nation. Crop production (including crops retained on the farm plus crops sold) accounted for 69.1% and 72.5% of total household income in the 2000/01 and 2003/04 marketing years. Animal product income accounted for 2.8% and 5.1% of total income in the two years, while off-farm activities accounted for 27.7% and 21.7%.

The cereal crops (predominantly maize, but also sorghum, millet, and rice) accounted for 38.3% and 35.1% of total household income, or roughly 55% of total crop production in 2000/01 and 48% in 2003/04 marketing years. Roots and tubers accounted for 14.2% of total household income in 2000/01 and 17.7% in 2003/04. Horticultural crops accounted for roughly 5.9% of total household income in 2000/01 and 4.6% in 2003/04, and 8.5% of total crop income in 2000/01 and 6.3% in 2003/04. All other crop categories accounted for less than 15% of total farm household income. Maize, cassava, cotton, groundnuts, and fresh fruits and vegetables are the major sources of crop income nationwide.

Table 1. Production Income Shares in the Small- and Medium-scale Farming Sector, Zambia

	2000/01 Marketing Year	2003/04 Marketing Year
	% of Total Income	
Crop production (of which)	69.1	72.5
Cereals	*38.3*	*35.1*
Roots and tubers	*14.2*	*17.7*
Beans and oilseeds	*8.3*	*9.6*
Non-food cash crops	*2.4*	*5.5*
Fruits and vegetables	*5.9*[1]	*4.6*[1]
Other crops	--[2]	*.1*
Animal products	2.8	5.1
Off-farm activities	27.7	21.7

Source: SS to the 1999/00 PHS, implemented in May 2001 and May 2004
Notes: Crop production is gross value not deducting input costs. Horticultural (fruit and vegetable) production was not collected but sales were.
[1]For purposes of computing income shares, horticultural crop production, which was not collected in the SS or PHS surveys, are estimated as double the value of horticultural sales.
[2]Other crops included in 2003/04, but not captured in 2000/01, are velvet beans, paprika, popcorn, sugarcane, sugar beans, green gum, and guinea peas.

4. FARM PRODUCTION AND MARKETING PATTERNS

Table 2 shows the number of smallholder farm households cultivating each crop, total production, sales, and on-farm consumption of selected crops and livestock products for the marketing years of 2000/01 and 2003/04.

The third column reports the percentage of households cultivating each crop. Roughly 78% to 80% of all smallholder households plant maize. The next most commonly cultivated crop was cassava, which was grown by 38% of the households in the 1999/00 crop season and 39% in the 2002/03 crop season. Groundnuts were the third most commonly cultivated crop, with 36% of households growing in 1999/00 and 42% growing in 2002/03. Sweet potato was fourth, cultivated by 28% and 19% of the households in 1999/00 and 2002/03. Each of the remaining crops were grown on fewer than 20% of smallholder farms nationwide; however, data on cultivation of fresh fruits and vegetables or livestock products were not available.

Between the periods of study, the households producing maize, sorghum, and cassava remained about the same. The number of households producing mixed and ground beans increased from 13% to 17%, whereas the number of households producing groundnuts increased from 36% to 42%. The number of households producing cotton increased from 6% to 10%. The only crop experiencing a drop in the number of households producing it was sweet potatoes, from 28% to 19%. The number of households producing tobacco remained the same.

It is important to note that despite maize being dominant in terms of cultivation and production, cassava and sweet potatoes, hitherto unheralded crops, are very important to smallholder farmers in Zambia, with almost half of all farms nationwide growing these crops. Also, judging from the value of crop revenue in column 8, it is suspected that horticultural crop production is much higher among Zambian smallholders than currently recognized.

The dominance of maize in production is rooted in historical government policy. Government policy—colonial, post-colonial UNIP government, and the MMD governments—all promoted the production of maize directly or indirectly albeit to varying degrees. Colonial governments responded to settler farmer demands to provide incentives and protection to support their maize production. The development of mines, livestock production, urban employment, and the British starch market (offering a premium for white maize) greatly expanded the demand for grain, which fueled the rapid expansion in maize production by both Europeans and Africans.

Maize became the cornerstone of an implicit and sometimes explicit “social contract” that the post-independence governments made with the African majority to redress the neglect of smallholder agriculture during the former colonial period (Jayne and Jones 1997). Starting at Independence in the mid 1960s, a prominent goal of government policy was to promote smallholder welfare, using maize production incentives as the main vehicle. Maize yields rose dramatically between 1960 and 1980.[3]

[3] The reader is cautioned to keep in mind the caveats about the CF estimates as mentioned in section 2.

Table 2. Farm Production Patterns of Small- and Medium-scale Agricultural Households in Zambia

Crop / Livestock Enterprise		% Producing	Total Production (MT)	Gross Value of Production (000 US$)	% Selling	Total Sales (MT)	Gross Value of Sales (000 US$)	Sales as % of Production – Mean Across Households	Sales as % of Production – National	% of Gross Farm Sales Revenue - National	Consumed on Farm (MT)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Maize	2000/01	77.9	1,260,123	102,531	25.5	272,950	23,647	12.2	23.1	10.3	987,173
	2003/04	79.9	1,365,103	140,575	28.4	370,332	38,955	13.5	27.7	10.2	994,771
Sorghum	2000/01	12.4	41,976	4,653	1.9	3,614	398	6.1	8.6	.2	38,363
	2003/04	10.3	40,887	4,574	2.0	5,378	602	7.7	13.2	.2	35,509
Sweet potato	2000/01	27.6	178,863	8,466	9.8	37,869	1,711	18.4	20.2	.7	140,994
	2003/04	18.8	138,227	5,127	7.7	51,581	1,918	24.6	37.4	.5	86,646
Cassava	2000/01	37.7	794,824	19,383	12.7	87,776	2,117	10.6	10.9	.9	707,049
	2003/04	38.8	836,057	50,905	11.1	70,491	4,339	9.2	8.5	1.1	765,566
Cotton	2000/01	5.7	43,359	10,491	5.5	41,938	10,147	96.6	96.7	4.4	1,421
	2003/04	10.5	123,085	31,259	10.3	118,461	30,087	96.5	96.2	7.9	4,624
Tobacco	2000/01	1.1	5,679	3,735	1.1	5,263	3,466	94.3	92.8	1.5	416
	2003/04	1.4	13,005	11,725	1.4	12,678	11,418	97.8	97.4	3.0	327
Mixed & ground beans	2000/01	13.0	27,297	7,735	6.7	10,782	3,088	29.7	39.9	1.4	16,516
	2003/04	17.2	35,460	9,423	9.5	15,704	4,177	30.3	44.3	1.1	19,756
Groundnuts	2000/01	35.8	56,586	17,089	13.8	14,672	4,475	19.2	26.2	2.0	41,914
	2003/04	42.1	89,100	26,871	20.1	24,409	7,345	23.0	27.3	1.9	64,691
Vegetables and fruits	2000/01	---	---	---	20.8	---	25,699	---	---	11.2	---
	2003/04	---	---	---	16.3	---	35,427	---	---	9.3	---
Livestock products	2000/01	---	---	---	32.3	---	13,058	---	---	5.7	---
	2003/04	---	---	---	44.5	---	33,206	---	---	8.7	---

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Notes: 2000/01 marketing year refers to April 2000 to March 2001; 2003/04 marketing year refers to April 2003 to March 2004. Horticultural (fruit and vegetable) production was not collected but sales were. Column 9 figures are computed as the weighted mean across all household levels, i.e., (sales/production)*100. Column 10 figures aggregate total weighted sales and production across all farmers, then takes the mean of this, i.e., (total sales/total production)*100.

In 1991, the MMD government took the reigns of political power on a platform of a liberalized political dispensation. To a great extent, this was done in most sectors of the economy, although there is debate in development circles about whether it was done correctly. The MMD government greatly scaled down the pan-territorial pricing policy and government maize buying apparatus. Starting in the early 1990s, these marketing policy changes led to a diversification by smallholder farmers to other crops, which provided better marketing opportunities. Fertilizer credit programs continued and the main use of this fertilizer was maize.

The New Deal MMD government that came to power in 2001 pursued a different policy which re-introduced pan-territorial pricing and a government-led buying agent, the Food Reserve Agency (FRA). The extent of the crop bought was much less, but this is slowly being scaled up. In the year 2006, the government, through the FRA, intends to purchase close to 25% of the marketed crop. This re-introduction of the price supports could, in part, explain the increase of sales as a percentage of production rising from 23% in the 2001 marketing season to 28% in the 2004 marketing season.

Column 6 of Table 2 shows the percent of households selling that crop. Roughly 25% of smallholder farmers in Zambia sold maize in both the 2000/01 and 2003/04 marketing years. About 21% and 16% of farmers sold fresh horticultural crops in these two years, while 14% and 20% of farmers sold groundnuts, and 13% and 11% of households sold cassava. The proportion of farmers selling cotton nationwide has risen dramatically in the past several years, as cotton prices have recovered since the late 1990s; cotton was sold by just over 10% of all smallholder farms nationwide in 2003/04.

Columns 4 and 7 of Table 2 show total crop production and sales in metric tons. It is not meaningful to make inter-crop comparisons because of weight/value differences. But taking the ratio of sales to production provides a picture of the degree of commercialization of particular crops. As shown in column 9, **maize** sales, as a percent of maize production as a mean of all households nationwide, were 12% and 13.5% in the 2000/01 and 2003/04 marketing years. At the national level (total sales as a proportion of total production), these are 23% and 28% (column 10). For **beans**, the mean proportion of production sold by smallholder farmers was 30% at the household level and 40% to 44% nationally. For **groundnuts,** it was 19% to 23% at the household level and 26% to 27% nationally. For **sweet potatoes,** it was 18% to 24.5% at the household level and 20% to 37% nationally. For **cotton,** it was the same for household level and nationally 97% for both years. And for **tobacco,** it was 94% to 98% at the household level and 93% to 97% nationally.

According to PHS data, cassava production increased dramatically over the 1990s. The production growth was +71% between 1992 and 1998 in northern province alone. Luapula province had a growth of 31% over the same period (Zulu et al. 2000). Growth in cassava production seems to have stabilized from the 2001 production year onwards. Sales as percent of production were 10.6% down to 9% at the household level and 11% down to 9% at the national level between the 2000/01 and 2003/04 marketing seasons, according to the SS data in Table 2 (columns 9 and 10). The bulk of this cassava is grown in the wetter northern parts of the country where temperatures do not fall as much in the winter months. The cassava production increase over the 1990s can be attributed to advances in productivity through the introduction of early maturing varieties and pest resistant varieties. In addition to this, the withdrawal of price supports for maize has led farmers to diversify their production patterns toward crops well suited to the agroecological conditions in the northern part of the country,

including cassava. A question that remains unanswered is what effect the re-introduction of price supports for maize will have on cassava production.

The value of crop sales is presented in column 8 of Table 2. There is a widely held notion that maize is the major source of crop revenue for most smallholder households in Zambia. Yet in both years, horticultural crop sales are roughly equivalent to the value of maize sales nationwide (column 11). Both maize and horticultural crops generated about US$ 25 million in 2000/01 and between US$35 million to US$39 million in 2003/04. However, data are not available to assess the proportion of households producing horticultural crops, though it is known that between 15% to 20% of small farmers nationwide sell horticultural crops. Sales of animals and animal products are also shown to account for a substantial portion of sales revenue in the smallholder farm sector, accounting for 50% to 75% of the sales revenue generated from maize sales.

Household retained crop production is shown in column 12. These figures may differ somewhat from actual consumption levels because they do not count purchases or changes in storage. Maize was the dominant crop consumed from own production by smallholder households (almost one million tons in both 2000/01 and 2003/04). Cassava retentions were in the range of 707 million to 766 million tons, while all other crops were considerably lower than maize and cassava. Sorghum retention went from 38 million down to 35 million tons while groundnuts increased in retention from 42 million to 65 million tons, while bean retention was less than 21 million tons.

The emergence of cotton and tobacco over the three years is also noteworthy. Smallholder cotton sales accounted for US$30 million in 2003/04, while tobacco contributed US$11 million. Together, the value of cotton and tobacco sales in 2003/04 exceeded that of maize. Livestock product sales also appear to have risen dramatically between 2000/01 and 2003/04, accounting for over US$33 million in the latter year.

The strong commercial performance of crops, such as cotton, tobacco, fruits and vegetables, and livestock products, is a hitherto unheralded phenomenon in Zambia. Yet the combined value of sales from these enterprises is at least three times as great as maize in both years analyzed in this paper. With supportive policies and public investments, these crops could be further expanded in the small-scale farm sector and could prove to be an important engine for poverty reduction in rural Zambia. The same question that was posed for cassava as to what will happen to the production and marketing of the non-traditional crops with the reintroduction on pan-territorial maize price supports can be posed here. In the short term, the negative effects of a strengthened kwacha pose a threat to these non-traditional export crops (Fynn and Haggblade 2006).

A challenge for policy makers and other stakeholders is how to embrace and support these non-traditional agricultural enterprises of fruits, vegetables, non-food cash crops, and livestock. These activities are very important income-generating sources for many smallholder farmers, and would have an important role in a comprehensive agricultural commercialization strategy.

Overall, Zambian agriculture seems to have become more diversified over the past decade, with maize, cassava, groundnuts, cotton, horticultural crops, and animal products all becoming important sources of cash revenue, as well as production for home consumption (except, of course, cotton). However, this nationwide picture masks considerable variation across regions, and a more geographically disaggregated description is discussed next.

5. REGIONAL CROP SALES PATTERNS

This section presents information on the spatial dimensions of marketed farm output. Table 3 disaggregates Zambia by agroecological zones, of which there are three. These agroecological zones are distinguished by soil type and mean rainfall. Agroecological Zone I comprises the most southerly lowland swathe of land where rainfall is relatively low. Zone II comprises the middle belt of the country, which is higher in altitude and therefore receives more rainfall, and is generally of good soil quality. Zone III is in the north of the country, receiving the most rainfall of the three zones, but some of these areas have highly acidic soils which reduce the potential of nitrogen fertilizer to contribute to crop productivity.

By overlaying the agroecological map over the village sites in the PHS/SS data, it was not possible to definitely assign all villages to a particular zone. Therefore, four (not three) agroecological zones were defined as follows: least rainfall zone (households unambiguously in districts in Agroecological Zone I); lower rainfall zone (households unambiguously in districts in Agroecological Zone II); higher rainfall (households in districts overlapping Agroecological Zones II and III); and highest rainfall zone (households unambiguously in districts in Agroecological Zone III).

Table 3 shows the specific crop's contribution to total gross farm revenue of selected enterprises by agro-zone for the 2001 and 2004 marketing years. For the least rainfall zone, the highest proportions of gross farm revenue were from cereals (34% and 21%) and animal products (29% and 27%). Roots and tubers were insignificant in this area.

In the lower rainfall zone (Agroecological Zone II), non-food cash crops were the dominant source of cash income from farming activities, accounting for 34% and 53% of gross farm revenue in the 2000/01 and 2003/04 marketing years. Cereals accounted for 22% to 16% of gross farm revenue in the two seasons, while fruits and vegetables accounted for between 26% and 9%. Animal product sales provide 9% and 14% of gross farm revenue. Tubers contributed an insignificant 1% in this lower rainfall zone.

In the higher rainfall region (districts overlapping Agroecological Zones II and III), cereal crops accounted for the highest proportion of gross farm sales revenue in both marketing seasons, at 45% and 40%, respectively. Next in importance was the revenue from the sale of animal products, contributing 16% of gross farm revenue. Fruits and vegetables, roots and tubers, beans and oilseeds, and non-food cash crops all accounted for 1% to 17% of gross farm revenue.

In the highest rainfall region (Agroecological Zone III) of northern Zambia, cereals contributed the highest proportion of gross farm revenue (28% and 27%, respectively). In order of importance, after cereals, are fruits and vegetables (37%), beans and oilseeds (16% and 13%), roots and tubers (10%), and animal products (9% and 13%). Cotton and tobacco are not commonly grown in this region, hence non-food cash crops contribute very little to smallholders' cash incomes.

Nationwide, cereals (mainly maize) account for 21% to 34% of gross farm revenue from the small- and medium-scale farming sector. Fruits and vegetables, crops not historically covered on the PHS surveys, account for 27% to 29% of gross farm revenue, while cotton and tobacco account for 9% to 12%, and animal products account for 27% to 29%. While cassava is an important food security crop in production, Table 3 reveals that relatively little cassava is marketed (except in the highest rainfall zone). However, the relative stability of

root and tuber crop production in the face of weather instability could be affecting crop sales categories for other food crops, especially cereals. Haggblade[4] argues that the rise of cassava production, a drought tolerant crop that can be stored in the ground, frees up maize production for sale during drought years, which could add significantly to the stability of marketed cereal output. In other words, in times of drought (maize scarce years), farmers will choose to sell the maize since the price is high and harvest the cassava for consumption. In maize surplus years, the farmer can choose not to harvest the cassava and consume the maize.

The last two columns of Table 3 examine each agroecological zone's contribution to national gross farm sales revenue and mean farm sales revenue per household. Because of better rainfall in the 2002/03 crop season, total farm sales were almost double in the 2003/04 marketing year compared to 2000/01. Interestingly, gross farm revenue per household is highest in the low-rainfall areas and lowest in the high-rainfall areas. The least rainfall zone registered a mean of US$216 of sales revenue per household in 2003/04.[5] The lower rainfall zone has had relatively high marketed output per household (US$187) due to this region's emphasis on high-value crops: cotton, tobacco, and fruits and vegetables. The two highest rainfall zones had the lowest level of mean farm commercialization, with both regions below the national mean of farm sales revenue per household in both years. However, the food security picture by region may be different, as the southern low-rainfall areas are highly dependent on maize as their food staple, while the northern high-rainfall regions are more diversified and benefit from the availability of cassava, a drought-tolerant crop.

Table 4 reveals more about why the least rainfall and lower rainfall zones have the highest mean farm sales revenue per household. This table presents information about each agro-zone's contribution to national sales revenue for each crop type and animal products. For example, although the least rainfall zone has the second lowest number of agricultural households of the four zones, it accounted for 44% and 46% of national sales revenue generated from animal products in 2000/01 and 2003/04. By contrast, the highest rainfall zone, which has the highest population of farm households, contributed only 22% of national animal product sales in the two years. The lower rainfall zone accounted for 83% and 79% of national marketed output from the relatively high-value non-food cash crops (cotton and tobacco), as well as a relatively high proportion of the smallholder sector's animal product sales. Sales revenue from relatively low-valued roots and tubers was highest in the highest rainfall region, contributing 70% and 72% of the total sales from the smallholder sector. Sales revenue from cereals was relatively proportional to the number of rural households in each zone, being the highest in the highest rainfall zone and lowest in the higher rainfall zone.

[4] Steve Haggblade, personal communication, 2006.
[5] This analysis omits two households that produced and marketed very large amounts of sugarcane.

Table 3. Specific Crop's Contribution to Total Gross Farm Sales Revenue of Selected Enterprises, by Agro-zone for the 2000/01 (1st Row), 2003/04 (2nd Row) Marketing Years

Zone	Marketing Year	Number of Households (weighted)	Cereals	Roots/ tubers	Beans/ oilseeds	Non-food Cash Crops	Other Crops	Fruits and Vegetables	Animal Products		Gross Farm Revenue	
			% share of gross farm revenue								000' US	US$ per household
Least Rainfall (Agro-zone I)	2000/01	231,858	34.3	1.8	4.1	9.2	--	21.8	28.8	100%	19,841	86
	2003/04	264,460	21.4	.4	2.5	12.3	22.8	14.1	26.5	100%	57,559	218
Lower Rainfall (Agro-zone II)	2000/01	297,220	22.3	1.2	8.0	33.6	--	25.6	9.4	100%	33,694	113
	2003/04	331,148	16.1	1.3	6.5	52.8	.2	9.4	13.8	100%	61,909	187
Higher Rainfall (overlapping Agro-zones II and III	2000/01	147,628	45.3	7.5	8.7	5.4	--	17.2	15.9	100%	8,258	56
	2003/04	165,697	40.1	9.2	11.1	12.6	.3	10.3	16.4	100%	13,033	79
Highest Rainfall (Agro-zone III)	2000/01	450,217	27.7	10.2	15.8	.3	--	36.6	9.2	100%	30,978	69
	2003/04	505,839	27.3	10.1	12.9	.2	.2	36.2	13.1	100%	55,679	110
National	2000/01	1,126,921	34.3	1.8	4.1	9.2	--	21.8	28.8	100%	26,427	82
	2003/04	1,267,145	21.4	.4	2.5	12.3	22.8	14.1	26.5	100%	52,123	149

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Notes: Least rainfall zone (households in districts in Agroecological Zone I); lower rainfall zone (households in districts in Agroecological Zone II); higher rainfall (households in districts overlapping Agroecological Zones II and III); highest rainfall zone (households in districts in Agroecological Zone III). 2000/01 marketing year refers to April 2000 to March 2001; 2003/04 marketing year refers to April 2003 to March 2004

Table 4. Specific Agro-zone Contribution to Total Gross Farm Sales Revenue of Selected Enterprises in Zambia, for the 2000/01 (1st Row) and 2003/04 (2nd Row) Marketing Years

Zone	Marketing Year	Number of Households (weighted)	Cereals	Roots/ tubers	Beans/ oilseeds	Non-food Cash Crops	Other Crops	Fruits and Vegetables	Animal Products
			% share of gross farm revenue						
Least Rainfall (Agro-zone I)	2000/01	231,858	25.6	7.7	8.9	13.3	--	16.8	43.8
	2003/04	264,460	28.8	2.7	10.2	17.1	98.3	23.0	45.9
Lower Rainfall (Agro-zone II)	2000/01	297,220	28.1	8.8	29.5	82.7	--	33.5	24.2
	2003/04	331,148	23.3	10.0	28.6	78.8	.7	16.4	25.7
Higher Rainfall (overlapping Agro-zones II & III)	2000/01	147,628	14.0	13.7	7.8	3.3	--	5.5	10.1
	2003/04	165,697	12.2	15.4	10.2	4.0	.3	3.8	6.4
Highest Rainfall (Agro-zone III)	2000/01	450,217	32.3	69.8	53.7	.7	--	44.2	21.9
	2003/04	505,839	35.6	71.9	51.0	.2	.7	56.9	22.0
National	2000/01	1,126,921	100	100	100	100	--	100	100
	2003/04	1,267,145	100	100	100	100	100	100	100

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Notes: Least rainfall zone (households in districts in Agroecological Zone I); lower rainfall zone (households in districts in Agroecological Zone II); higher rainfall (households in districts overlapping Agroecological Zones II and III); highest rainfall zone (households in districts in Agroecological Zone III). 2000/01 marketing year refers to April 2000 to March 2001; 2003/04 marketing year refers to April 2003 to March 2004.

6. MAIZE MARKETING PATTERNS

The crop that occupies the most time of agricultural policy makers is clearly maize. This is largely understandable given that maize still is the single most important crop in Zambia's smallholder sector in terms of gross value of production and gross value of crop sales, as shown in Tables 1 and 2. As such, it is commonly understood that policies to influence maize production and input use on maize constitute the major means by which to promote smallholder income growth and food security. Policies of the Government of the Republic of Zambia (GRZ) aimed to support smallholder incomes from maize production include producer support prices offered by the FRA, tariffs on imported maize to restrict inflows of maize that might undercut farm prices, and government programs to make subsidized fertilizer available for use on maize.

Using the weighted PHS-SS data, there were an estimated 1,126,921 smallholder households in the 2000/01 marketing year, and 1,267,145 households in the 2003/04 marketing year. All smallholder households were ranked according to their sales of maize and then divided into three groups:

(1) the 5% of farms in the smallholder sector that sold the most maize. This group accounted for 14,261 households in 2000/01 and 17,974 households in 2003/04, and accounted for about 40% to 45% of all the maize sold nationwide by smallholder farmers;

(2) the rest of the smallholder farms selling maize (this is the 95% of smallholder farmers not in the top 5% of maize sales). This group constituted roughly 272,805 households in 2000/01 and 341,916 households in 2003/04; and

(3) those smallholder farms not selling any maize. This group was by far the largest group, accounting for between 839,855 and 907,255 households nationwide.

Various indicators of household welfare for these three groups of households are reported in Table 5. There are remarkable differences between these three groups. For example, mean household income for Group 1 (the top 5% of maize selling households) was US$2,528 and US$3,847 in 2000/01 and 2003/04 compared to US$577 and US$675 for the remaining 95% of maize selling households, and US$318 and US$415 for the rest of the farm households in Zambia not selling any maize. Household incomes of the top 5% of maize selling households were 8 to 9.2 times higher, on average, than the households not selling maize, who account for around 75% of all of Zambia's smallholder households.

Table 5 also indicates that the total area under crops among the top 5% of maize sellers is 3.9 to 4.8 times greater than the non-maize selling households, and 2.5 to 3 times greater than the rest of the maize sellers. The households that sold smaller quantities of maize cropped 1.5 times the area of non-maize sellers. The value of off-farm income among the top 5% of maize sellers was four to five times higher than off-farm income of the smaller maize sellers and seven times higher than that of households not selling maize. The top 5% of maize sellers also had five to seven times as much revenue from livestock products as the smaller maize sellers, and 8 to 10.5 times as much as the households not selling maize. Gross value

Table 5. Attributes of the Highest 5% of Maize Sellers Versus the Rest of Maize Sellers and Households Not Selling Maize in the 2000/01 and 2003/04 Marketing Years (US$ and Kwacha)

Attribute		Marketing Year	Highest 5% of Maize Sellers (n= 14,261 in 2000/01) (n=17,974 in 2003/04)	Rest of Maize Sellers (n=272,805 in 2000/01) (n=341,916 in 2003/04)	Households Not Selling Maize (n=839,855 in 2000/01) (n=907,255 in 2003/04)	National Total (n=1,126,921 in 2000/01) (n=1,267,145 in 2003/04)
			---------- Mean Values ---------			
Total household income	(US$)	2000/01	2,528	577	318	409
		2003/04	3,847	675	415	534
	(Kwacha)	2000/01	12,123,104	2,765,156	1,525,246	1,959,518
		2003/04	18,449,496	3,239,131	1,999,788	2,569,387
Value of off-farm income	(US$)	2000/01	1,102	276	168	206
		2003/04	1,453	282	190	233
	(Kwacha)	2000/01	5,282,832	1,323,951	804,711	987,078
		2003/04	10,335,555	2,081,427	1,655,130	1,927,706
Gross value of sales	(US$)	2000/01	1,009	141	48	82
		2003/04	1,828	196	97	148
	(Kwacha)	2000/01	4,840,614	674,563	228,401	394,775
		2003/04	8,765,399	941,093	466,223	712,076
Gross value of maize sales	(US$)	2000/01	646	53	0	27
		2003/04	983	62	0	38
	Kwacha)	2000/01	3,098,547	253,692	0	129,227
		2003/04	4,711,587	298,680	0	184,442
Value of productive assets	(US$)	2000/01	1,071	180	117	144
		2003/04	1,731	317	231	275
	Kwacha)	2000/01	5,138,034	864,792	558,789	690,816
		2003/04	8,301,493	1,519,196	1,107,085	1,320,334
Value of income from livestock products	(US$)	2000/01	97	14	9	12
		2003/04	175	31	21	26
	Kwacha)	2000/01	463,877	69,045	44,258	55,569
		2003/04	891,651	172,615	131,264	155,961
Distance to nearest tarmac road	(km)	2000/01	15.00	23.17	26.12	25.27
		2003/04	14.66	24.54	25.79	25.29
Total area under crops	(hectares)	2000/01	4.91	1.92	1.26	1.47
		2003/04	6.22	2.04	1.29	1.56

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Notes: 2000/01 marketing year refers to April 2000 to March 2001; 2003/04 marketing year refers to April 2003 to March 2004

of crop sales and productive farm assets was equally skewed. And the top 5% of maize sellers are in areas more accessible to markets. Their mean distance to the nearest tarmac road was 15 kilometers compared to 23 to 24.5 kilometers for the smaller maize sellers, and over 25 kilometers for the rest of the smallholder households in Zambia.

The picture that emerges from Table 5 is an extremely skewed distribution of farm income and off-farm income, owing to disparities in landholding size, other productive assets, and access to markets. The top 5% of maize sellers account for about 1.3% and 1.4% of the total number of smallholder households in Zambia in 2000/01 and 2003/04. Yet despite their relatively small numbers, these households accounted for almost half of the maize sales from the smallholder sector, and about 17% and 20% of the total value of crop sales of the smallholder sector.

The households not selling maize, which make up roughly 75% of the total number of smallholder farms in Zambia, are largely subsistence oriented farmers, selling very small surpluses of other crops, have relatively small farm sizes, are generally further from markets and roads, have relatively little off-farm and livestock-related sources of incomes, and therefore have very low total incomes.

These numbers indicate a great degree of heterogeneity within Zambia's small farm sector. Policies aimed to support the prices of maize may be benefiting a relatively small and relatively well-off group of farmers and bypassing the majority of small farmers in Zambia. As will be seen in the next section, there are a few groups within this group of households not selling maize that are doing relatively well, but the majority clearly do not.

7. BUYING AND SELLING BEHAVIOR OF SMALLHOLDER FARMERS

Apart from the widely held notion that the majority of smallholder farmers are sellers of maize, there is the related perception that smallholder farmers, by and large, are self-sufficient in maize and only purchase grain in drought years. This notion has contributed to some of the maize pricing and trade policies specified earlier that raise maize market prices in Zambia. These perceptions also explain the fact that very little attention has been paid to the development of intra-rural grain markets.

Tables 6 and 7 categorize rural households according to their position in the maize and maize meal markets in the 2001 and 2004 marketing season, respectively. There are seven categories of households with respect to the maize production and marketing patterns:

1. *Households that produce and sell maize, and don't purchase maize or maize meal.* These households accounted for 17% and 20% of the smallholder households nationwide in 2000/01 and 2003/04, respectively.

2. *Households that produce but don't sell maize, and instead buy maize and/or maize meal.* These households accounted for 25% of the smallholder households nationwide in both marketing years.

3. *Households that do not produce or sell maize, but do buy maize and/or maize meal.* These households are located primarily in the northern, northwestern, and Luapula provinces, and accounted for 9.2% and 9.6% of the smallholder households nationwide in 2000/01 and 2003/04.

4. *Households that may produce maize but are not in the market either as maize sellers or purchasers.* These autarkic (non-maize trading) households accounted for 40% and 37% of the smallholder populations nationwide in 2000/01 and 2003/04.

5. *Households that produce, sell, and buy maize and/or maize meal, but they sell more than they buy over the course of the year.* These *net maize sellers* accounted for 5.2% and 4.8% of the total number of smallholder households nationwide in the two years.

6. *Households that produce, sell, and buy maize and/or maize meal, but they buy more than they sell over the course of the year.* These *net maize buyers* accounted for 3% and 3.3% of the total number of smallholder households nationwide in the two years. Note the households that both sell maize and buy maize or maize meal in the same year are a relatively small proportion of the total sample of households, less than 10% in either year.

7. *Households that produce, sell, and buy maize and/or maize meal with net sales equaling zero.* There are a very few households in this category and are not considered in this discussion.

Tables 6 (2000/01) and 7 (2003/04) reveal a number of interesting insights about each of these six groups and the sub-groups within them. All households nationwide were ranked by their household income levels, and then grouped into three income categories (low, medium, and high). This is shown in the third column of Tables 6 and 7. These tables thus show the household characteristics for 18 sub-groups (six maize market position groups * three income groups). The seventh group is ignored for this analysis. The table also shows the proportion

of households in each of the six categories that are in the low, medium, and high income terciles.

Regarding Group 1, for the maize selling households that do not buy maize or maize meal, about half of this group is in the highest income category in both years. These households include 80% of the households in the top 5% of maize sales as discussed earlier in Table 5. The mean household income of Group 1 (US$1,149 in 2000/01 and US$1,571 in 2003/04) is among the highest of the 18 sub-groups. Landholding size and value of farm assets are also the highest of all 18 sub-groups.

The other two sub-groups within the Group 1 category (producers and sellers of maize in the bottom and middle income terciles) have much lower landholding sizes, educational levels of their household heads, incomes and farm asset values, and have relatively paltry maize and total farm production values (US$18 and US$19 per household in the 2000/01 and 2003/04 seasons, respectively). Even if these households were able to obtain 25% higher prices for their maize, it would add only US$6 and US$4 to these households' annual income, given than they sell such small amounts of maize. The main beneficiary of supportive maize prices would be the highest income group in this category who sell the most maize.

Within Group 2 (households that produce maize but also buy maize and/or maize meal), in both 2000/01 and 2003/04, the largest number of households is in the bottom income tercile. These households produce very few crops, their value of agricultural production being US$62 in 2000/01 and US$74 in 2003/04. These low-income maize buyers are among the most food insecure of all sub-groups, as they produce little maize and also produce very little income from other farm and off-farm activities. This group would appear to be adversely affected by relatively high maize prices. On the other hand, the minority of households in Group 2 that are in the top income tercile have relatively high education levels (nine in the two years) and relatively high off-farm incomes, which means that not all maize buyers are poor or among the most vulnerable.

Within Group 3 (households that do not produce maize but do buy maize and/or maize meal), most of these households are also relatively poor in terms of their total household incomes and assets (a proxy for wealth). Households in this group (and all the other groups), who are in the highest income tercile, have a relatively high mean educational level for the household head and higher off-farm incomes.

Group 4 (households that neither sell nor buy maize), accounts for 40% (2000/01) to 37% (2003/04) of all households nationwide. These households are concentrated in eastern, Luapula, and northern provinces. These households fall disproportionately into the lowest income tercile, and have relatively low incomes, asset levels, farm sizes, and educational levels compared with households in each of the other maize market position groups.

Contrary to widespread perceptions that many smallholder farmers sell grain after harvest and buy back grain later in the season, only about 8% sell and buy back maize according to data from the two seasons (sum of households in Groups 5, 6, and 7 in Tables 6 and 7). Within this 8%, there appears to be two types of households. A large proportion of households in these three groups sell large amounts of maize and buy back small amounts of maize meal. These net maize sellers closely resemble the characteristics of households in Group 1 in the highest income group (those that only sell maize).

Table 6. Characteristics of Rural Households According to Their Position in the Maize and Maize Meal Markets, 2000/01 Marketing Year, Zambia

Type of Maize Seller	% of Sample	Income Tercile (number of hh)		Value in US Dollars: Net Maize + Maize Meal Sales (Pur-chases)	Value of Maize Produc-tion	Agricultural Production (Crop & Animal Gross Revenue)	Off-farm Income	Total House-hold Income	Value of Produc-tive Assets	Cropped Land Size (ha)	Family Size (adult equiva-lents)	Highest Level of Education for a Member (years)	Distance to Nearest Tarred/ Main Road (km) from Center of SEA	Distance to Nearest District Town (km) from Center of SEA
1. Seller of maize, does not buy maize or maize meal (n=193,511)	17.2	1	25,690	19	58	87	8	94	39	1.1	3.6	6.1	32	39
		2	72,845	38	118	210	27	237	144	1.8	4.3	6.9	27	39
		3	94,975	151	343	623	526	1,149	450	3.0	5.8	8.8	21	34
2. Buyer of maize or maize meal, does not sell, but produces maize (n=285,475)	25.3	1	112,815	-29	38	62	-18	43	63	1.0	4.2	6.1	21	31
		2	89,305	-30	78	153	74	227	135	1.4	4.9	7.1	24	32
		3	83,356	-54	84	254	778	1,031	177	1.5	5.7	9.5	19	28
3. Buyer of maize or maize meal, does not sell or produce maize (n=103,917)	9.2	1	51,145	-37	0	40	22	62	21	.6	3.9	6.1	28	31
		2	29,969	-23	0	115	105	220	36	1.0	4.5	7.0	24	31
		3	22,803	-56	0	105	941	1,046	70	.9	4.7	8.8	26	27
4. Not in market (either grain or maize meal) (n=450,463)	40.0	1	197,833	0	25	63	9	72	53	.9	3.6	5.0	30	39
		2	167,772	0	62	181	39	220	122	1.6	4.4	6.4	30	40
		3	84,857	0	138	398	441	840	346	2.2	5.4	8.1	25	35
5. Buys and sells, net sales greater than 0 (n=59,096)	5.2	1	9,141	18	69	91	3	94	73	1.3	3.8	6.5	20	35
		2	21,337	33	117	180	55	235	81	1.5	4.3	7.3	19	33
		3	28,618	118	283	504	665	1,170	150	2.1	5.8	9.5	15	30
6. Buys and sells, net sales less than 0 (n=34,051)	3.0	1	6,940	-20	52	76	17	94	44	.8	3.6	5.7	30	41
		2	13,759	-15	96	158	58	216	89	1.3	4.3	7.0	15	36
		3	13,352	-34	122	286	1,323	1,609	148	1.8	5.7	9.4	22	30
7. Buys and sells, net sales equal 0 (n=408)	.0	2	398	0	45	71	122	193	1	2.0	4.1	9.6	5	12
		3	10	0	390	969	495	1,464	2,431	7.3	4.5	10.0	11	34
Total Sample (n=1,126,921)	100.0	1	403,564	-12	29	62	3	65	51	.9	3.8	5.5	27	36
		2	395,385	0	75	174	51	225	119	1.5	4.5	6.7	27	37
		3	327,972	35	186	411	642	1,052	289	2.1	5.6	8.9	21	32

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Table 7. Characteristics of Rural Households According to Their Position in the Maize and Maize Meal Markets, 2003/04 Marketing Year, Zambia

Type of Maize Seller	% of Sample	Income Tercile 1=lowest 3=highest	(number of hh)	Value in US Dollars: Net Maize + Maize Meal Sales (Pur-chases)	Value of Maize Produc-tion	Agricultural Production (Crop & Animal Gross Revenue)	Off-farm Income	Total House-hold Income	Value of Produc-tive Assets	Cropped Land Size (ha)	Family Size (adult equi-valents)	Highest Level of Educati on for a Member (years)	Distance to Nearest Tarred/Main Road (km) from Center of SEA	Distance to Nearest District Town (km) from Center of SEA
1. Seller of maize, does not buy maize or maize meal (n=257,160)	20.3	1	32,187	18	59	110	7	116	86	1.1	4.1	5.9	21	44
		2	91,664	37	107	251	29	280	196	1.8	4.9	7.2	28	40
		3	133,309	213	423	878	693	1,571	687	3.2	6.1	9.1	25	34
2. Buyer of maize or maize meal, does not sell, but produces maize (n=315,524)	24.9	1	132,150	-26	42	74	12	86	102	.9	4.8	6.0	24	33
		2	97,915	-31	77	199	65	264	238	1.4	5.4	7.2	24	30
		3	85,460	-52	123	413	994	1,407	738	1.7	6.5	9.2	26	29
3. Buyer of maize or maize meal, does not sell or produce maize (n=121,585)	9.6	1	59,477	-23	0	55	20	75	44	.6	4.2	5.7	20	31
		2	39,336	-28	0	162	111	273	53	1.0	4.9	6.9	17	29
		3	22,772	-51	0	264	870	1,134	336	1.0	5.4	8.8	18	31
4. Not in market (either grain or maize meal) (n=470,145)	37.1	1	206,356	0	30	78	8	86	57	.9	4.0	5.3	29	39
		2	165,879	0	68	234	39	272	197	1.6	5.1	6.6	29	37
		3	97,910	0	157	708	469	1,176	539	2.2	5.8	8.4	26	35
5. Buys and sells, net sales greater than 0 (n=60,601)	4.8	1	7,243	11	58	94	15	109	69	.9	3.6	6.4	13	27
		2	23,314	35	132	239	44	283	97	1.6	5.0	6.9	23	37
		3	30,044	122	290	590	542	1,132	497	2.4	5.9	8.9	19	32
6. Buys and sells, net sales less than 0 (n=41,613)	3.3	1	9,524	-14	56	100	13	112	98	1.2	4.9	6.7	29	45
		2	17,479	-28	92	201	69	270	179	1.4	5.1	6.7	17	32
		3	14,611	-33	111	373	589	963	362	1.8	5.7	8.7	24	26
7. Buys and sells, net sales equal 0 (n=516)	.0	1	326	0	31	70	0	70	9	1.9	2.7	.0	83	74
		2	190	0	142	237	63	300	9	1.4	5.8	10.0	0	27
Total Sample (n=1,267,145)	100.0	1	447,263	-9	33	77	11	88	72	.9	4.3	5.7	26	37
		2	435,777	-1	77	222	51	273	187	1.5	5.1	6.9	26	35
		3	384,105	67	241	653	697	1,350	613	2.4	6.1	8.9	24	32

Source: SS to the 1999/00 PHS, CSO, 2000/01 and 2003/04 marketing season

Looking across the entire sample in the last row, it is evident that there appears to be a strong relationship between households' net maize sales, household income, landholding size, value of other crop production, off-farm incomes, value of farm assets, and education levels. Households in the top income tercile are generally net sellers of maize and relatively well-off, while households in the bottom income tercile are buyers of maize and relatively disadvantaged in most respects.

8. CONCLUSIONS

The objectives of this study were to provide a comprehensive picture of crop production and marketing patterns in Zambia's small- and medium-scale farm sector, to examine how these patterns vary regionally, and to examine differences between poor and non-poor strata of the rural farm sector. A major limitation of the most official estimates of crop production among smallholder farmers in Zambia is that it excludes crops that have risen dramatically in recent years, such as fresh fruits, vegetables, and animal products. It is likely that official production estimates increasingly underestimate true agricultural output to the extent that smallholders' agricultural activities are increasingly dissimilar to the set of crops covered in the PHS from 1990/91 onward. Results in this study are derived from the nationally representative PHS and two SS to the PHS in 2001 and 2004. The SS involved revisiting the same rural households that were interviewed in the 1999/00 PHS with a set of "supplemental" questions, which are not normally asked in the regular PHS. These questions pertained to land access, production of a wider range of crops than those typically contained on PHS surveys, such as fruits and vegetables, information on non-farm and animal product income, and household socio-demographic characteristics. The first SS was conducted in May 2001 ands the second SS was conducted in May 2004.

Because so much policy attention in Zambia is focused on maize (e.g., the bulk of the government's budget allocation to the agricultural sector is devoted to the inputs into maize production and marketing), this report has emphasized small farmers' maize production and marketing behavior, and discussed implications for policy.

Crop production (including crops retained on the farm plus crops sold) accounted for 69.1% and 72.5% of total household income in the 1999/00 and 2002/03 crop years. Income from animal product accounted for 2.8% and 5.1%, while off-farm activities accounted for 27.7% and 21.7% of total household income. The cereal crops (predominantly maize, but also sorghum, millet, and rice) accounted for 38.3% and 35.1% of total household income in the two seasons. Roots and tubers accounted for 14.2% of total household income in 2000/01 and 17.7% in 2003/04.

The value of cassava production is about 40% to 70% the value of maize production. There was an increase in production of 71% between 1992 and 1998 in northern province alone. The bulk of this cassava is grown in the northern, more rainfall abundant part of the country. The increase can be attributed to advances in productivity through the introduction of early maturing varieties pest resistant varieties. In addition to this, the withdrawal of price supports for maize may have led farmers to diversify their energies to a crop that is suited to the agroecological conditions in the northern part of the country, which is cassava. An unanswered question concerns how the recent re-introduction of maize price supports and fertilizer subsidy programs will affect the growth in cassava production.

While maize remains the dominant crop in production, income from crop sales are considerably more diversified. In particular, there appears to be a great rise in smallholder revenue from the sale of fresh fruits, vegetables, and non-food cash crops as compared to maize. In both the 2000/01 and 2003/04 marketing years, horticultural crop sales were roughly equivalent to the value of maize sales nationwide. Sales of animals and animal products are also shown to account for a substantial portion of sales revenue in the smallholder farm sector, with these accounting for about 50% to 75% as much sales revenue as that generated from maize sales.

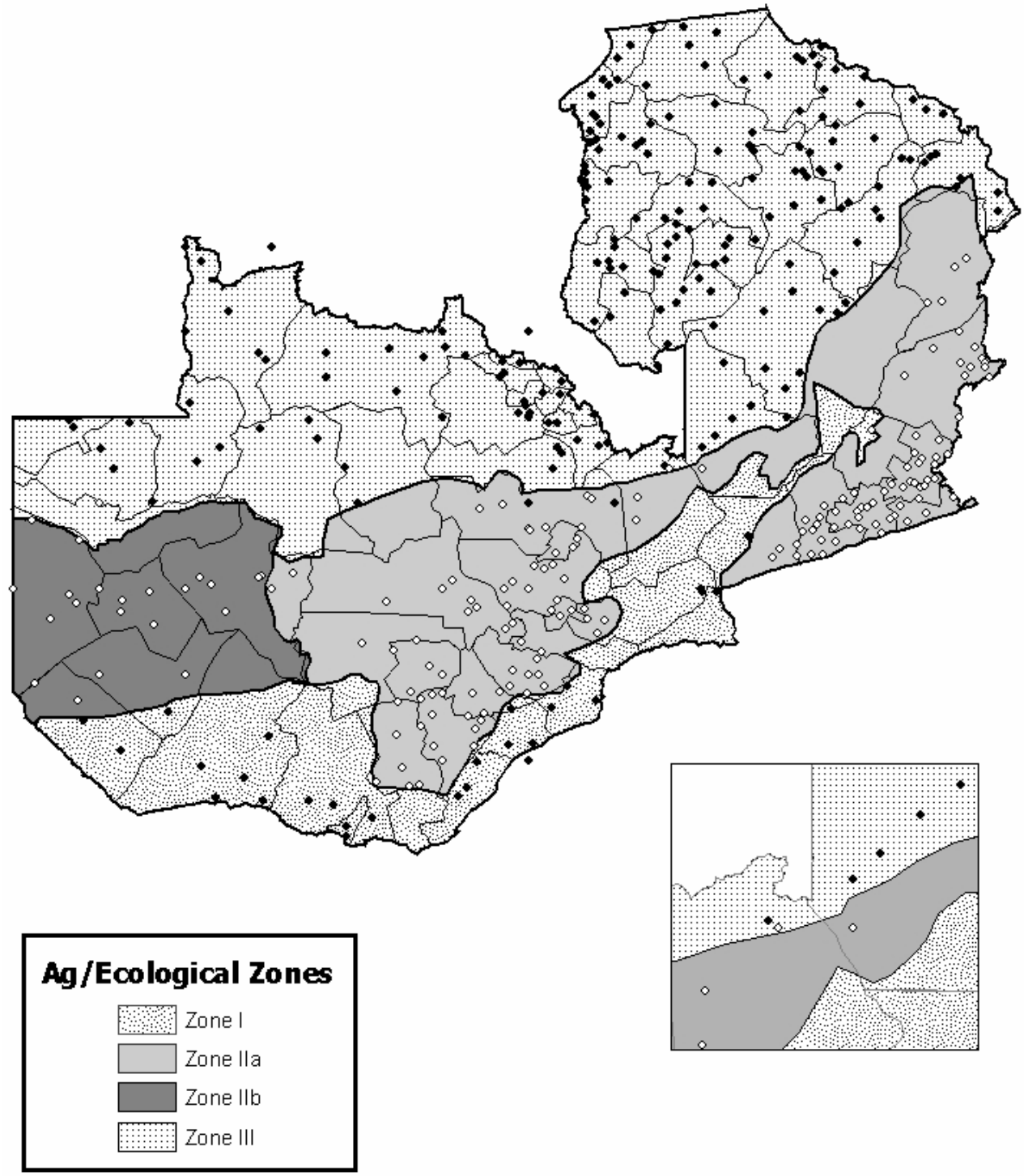
The emergence of cotton and tobacco over the three years is also noteworthy. The combined value of cotton and tobacco sales was less than that of maize in 2000/01, but exceeded the value of maize sales in 2003/04. Livestock product sales also appear to have risen dramatically between 2000/01 and 2003/04, accounting for over US$33 million in the latter year. With supportive policies and public investments, these crops and animal income activities could be further expanded in the small-scale farm sector and could prove to be an important engine for poverty reduction in rural Zambia.

There are significant regional variations in the composition of crop production and sales. In the high-rainfall areas in northern Zambia, sales revenue from fresh fruits and vegetables exceed that from either maize or cassava. In the north, a shift from maize to cassava has been well recognized, but there appears to have been a largely unrecognized shift in production and sales from maize to fresh fruits and vegetables. Maize production in the more remote northern areas of Zambia has become less attractive after the withdrawal of NAMBOARD (and other subsequent government organizations) pan-territorial support prices, and the reduction in the volume of subsidized fertilizer distributed through government programs (primarily used on maize). This may change if recent government purchases of maize at above-market prices continue. In the lowest rainfall zone of southern Zambia, income from animal production is relatively large, accounting for over 25% of gross farm sales revenue in both 2000/01 and 2003/04. In the middle rainfall belt, cotton, tobacco, and other non-food cash crops accounted for 33% to 50% of total gross revenue among smallholder farmers.

At the household-level, there is a strong positive correlation between households' net maize sales, household income, landholding size, value of other crop production, off-farm incomes, value of farm assets, and education levels. Households in the top income tercile are generally sellers of maize, while households in the bottom income tercile are buyers of maize. Nationwide, roughly 17% and 20% of the smallholder households in Zambia sold maize in 2000/01 and 2003/04. Another 5% of these farm households bought and sold maize but were net sellers. Roughly 35% of the smallholder households nationwide only purchased maize or maize meal, while another 3% both bought and sold but purchased more than they sold. Contrary to conventional beliefs that many smallholder farmers sell grain after harvest and buy back grain later in the season, only about 8% sell and buy back maize according to data from the two seasons.

About 40% to 45% of the total marketed supply of maize from the smallholder farm sector was produced by 2% of the smallholder farms, indicating a very high concentration of the marketed surplus. The facts that household maize sales are correlated with income and wealth and that more farm households are buyers or net buyers of maize than sellers imply that the majority of small-scale farm households may be adversely affected by price and trade policies designed to raise market prices of maize, and that these policies might have anti-poor distributional consequences. In a more general equilibrium analysis these first round results would need to be analyzed more fully, taking into account second-order effects through investments by better off smallholders and resulting labor markets adjustments before more comprehensive welfare effects could be inferred.

Annex 1. Map of Central Statistical Office Statistical Enumeration Areas (SEAs) Sampled in the CSO/MACO/FSRP Post-Harvest and Supplemental Surveys in 2001 and 2004 by Zambia's Agroecological Zones



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