

Outline of Presentation

1. Time-line and outputs of the 2010/2011 CFS (Mr. Isimwaa)
2. Analysis of the 2009/2010 Crop Forecast Survey data; *The Cost of Producing Maize for Smallholders in Rural Zambia* (Burke, Hichaambwa, Banda and Jayne)
3. *Discussion on implications for 2010/2011 CFS process* (Chair)

Data Collection Objectives of the 2010/2011 CFS

Key Milestones of the 2010/2011 Crop Forecast Survey include the following:

Activity	Date
Field Data Collection	13 March - 2 April 2011
Data cleaning, Tabulation and Calculation of Weights	12 April - 12 May 2011
Verification of Carry over stocks with the Maize Stocks Committee	15-30 April 2011
Preparations of the National Food Balance Sheet	12-14 May 2011
Presentation of CFS/NFBS results to Senior Management	14 - May 2011
Announcement of Official NFBS and CFS Estimates by Minister of Agric	14 - May 2011

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Data Collection Objectives of the 2010/2011 CFS

Major Data Outputs of the CFS	Tentative date Available
Land usage by household	14 - May 2011
Production quantities of all major Crops, yield rates etc	14 - May 2011
Quantities of inputs (seed, fert) used by crop	14 - May 2011
Purchase Cost of Fertilizer & seed by Crop	14 - May 2011
Household Cost of Transportation of Fertilizer	14 - May 2011
Total household expenditure on Herbicides	14 - May 2011
Expected Crop Sales of 2011 by Household	14 - May 2011
Crop Sales of 2010 Crop by Household	14 - May 2011

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Additional Data on Costs

In 2009/2010, the Crop Forecast Survey was modified to include specific questions relating to the smallholder's land, labor and capital costs associated with producing and marketing maize

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Land, labor and capital costs associated with producing and marketing maize

Source of Power	Variables Collected on Maize Field relating to Land Prep, planting, fert application, weeding, harvesting, transportation from field and shelling & packaging		
Unpaid Family Labour	Number of Males and Females	Hours	
Hired Manual Labour	Number of People	Hours	Total Cash expenditure
Animal Draught Power	Whether own or hired		Total Cash expenditure
Mechanical Power	Whether own or hired		Total Cash expenditure

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DATA AND METHOD

The CFS targets 13,600 small & medium scale households country-wide.*

The survey collected household and field level data on input use and harvests from 11,201* rural agricultural smallholders, of which 11,040 harvested maize

****The difference between 13,600 and 11,201 represents households that are either livestock only or did not grow field crops but may have grown garden crops. The figure of 11,201 also excludes households that were non contact***

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Three stages of cost buildup;

1. Compute cash expenditures for inputs such as; hired animals or labourers
fertilizer, seed, herbicides and
transportation of inputs and outputs

This is used to measure gross returns to household inputs (such as labour, land and other assets) at a given unit and selling price (e.g. gross returns per 50kg bag at the FRA buying price)

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Three stages of cost buildup;

2. After assigning some value to household labour, animal draught power and tractor use, we compute these household costs in addition to cash expenditures

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Three stages of cost buildup;

3. We assign a value to the land under cultivation and compute the total cost of production at the household level.

These calculations have been used to evaluate the productivity of Zambian smallholders and the extent of variability in the cost of producing maize within the smallholder farm sector

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Additional methodological issues in computing the cost of production;

- Data for the cost of hired labour and traction equipment was collected at the field level
 - Household-owned animals, equipment and household labour are valued at opportunity cost rates, that is rates that could be obtained in alternative employment if they were not employed at home. Information gathered from households that did hire these inputs was used to establish a local market rate for equipment and labour, and these values were assigned to the use of household assets
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Results

Key observations from the analysis of the data:

More than 80% (2.1 million MT) of Zambia's total maize output was produced at a total cost lower than the 65,000 ZMK FRA buying price

The mean total cost of production per bag was ZMK 45,459 (ZMK 40,739 per bag if the rental value of the maize plot is not included).

Cash expenditures on inputs per bag was ZMK 18,630 per bag

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Results (1)

Table 1: Maize Production Costs (ZMK/50kg bag) by Quintile

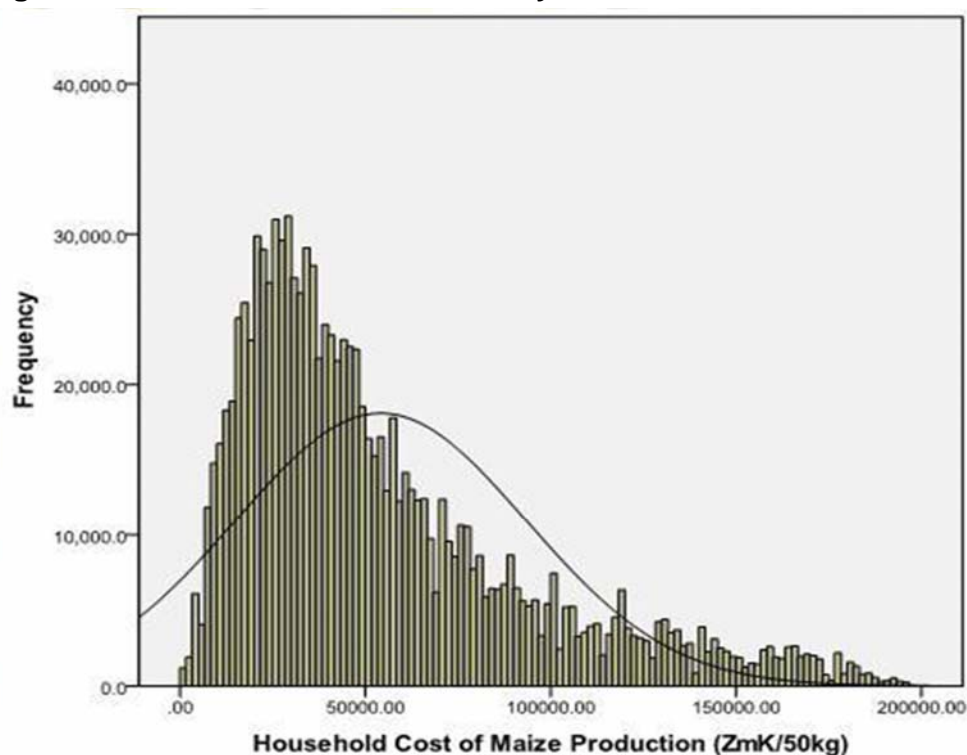
Share of total maize production (%)	Total Cost Quintile (ZMK/50 maize kg)					farmer mean	per 50 kg bag mean
	1	2	3	4	5		
	31.4%	27.1%	20.1%	12.8%	8.7%		
<i>Costs of production (ZMK/50kg)</i>	-----Mean-----						
Hired animal use	283	516	829	1,163	1,763	911	536
Hired machine/tractor use	22	57	49	153	103	77	97
Hired labor	1,493	2,662	3,340	4,825	6,619	3,788	3,438
Basal dressing ^a	1,314	2,479	2,897	3,549	4,419	2,932	3,487
Top dressing ^a	1,290	2,585	2,964	3,863	4,627	3,066	3,576
Fertilizer transport to homestead	39	108	143	184	223	139	193
Transport cost to FRA depot	349	606	407	296	208	373	763
Transport cost to private buyer	189	365	543	544	997	528	2,044
Herbicides	15	24	63	17	46	33	62
Seeds ^a	1,417	2,838	3,734	4,853	8,478	4,265	4,434
Total cash expenditures	6,411	12,239	14,969	19,449	27,482	16,111	18,630
Family labor	8,274	15,379	25,585	41,810	87,103	35,638	19,745
Own animal use	873	1,431	2,179	3,071	4,287	2,368	2,304
Own machine use	9	29	43	12	82	35	61
Expenditures plus household labor and assets (excl. land)	15,567	29,078	42,776	64,341	118,953	54,152	40,739
Land annual rental	3,364	4,835	6,633	9,152	15,102	7,818	4,720
Total Cost (incl. land cost)	18,931	33,914	49,409	73,493	134,055	61,970	45,459

Source: MACO/CSO Crop Forecast Survey, 2010.

Note: a) Fertilizer and seed costs include both subsidized and commercially acquired inputs.

Results (2)

Figure 1: Distribution of Households by Total Cost of Production



Results (3)

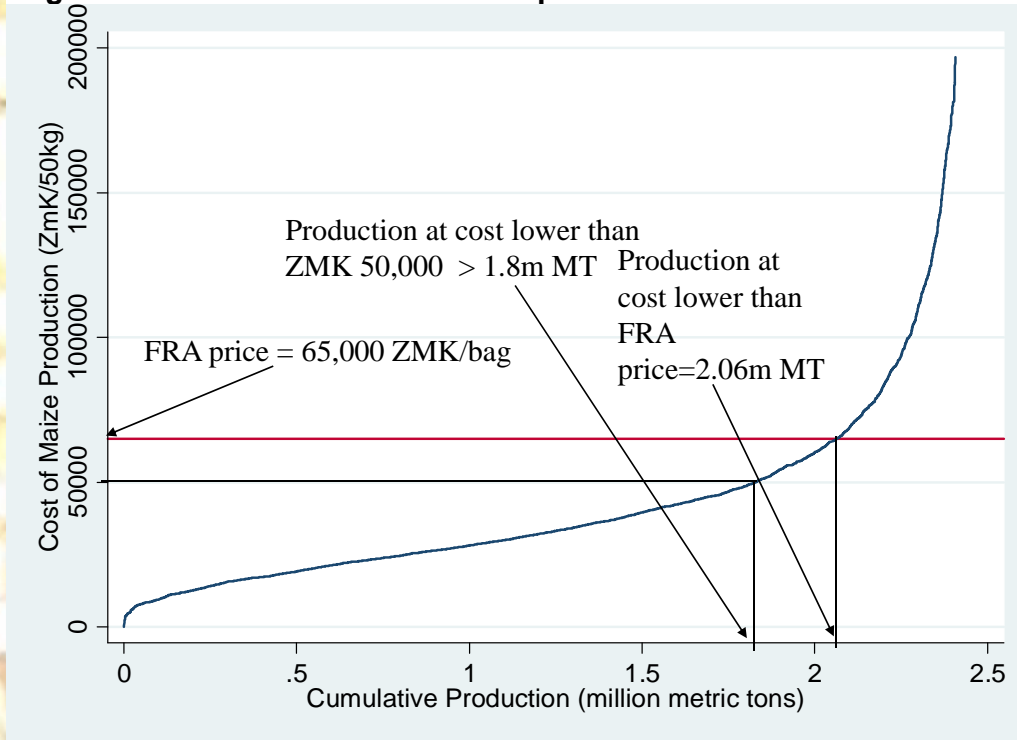
Table 2: Cost and Share of Total Production by Province and AEZ

Province	Share of Total Production	Total Cash Expenditures	Expenditures plus household labor and assets (exl. land)	Total Cost of Production
		-----ZMK per 50 kg bag-----		
Central	0.21	23,237	43,958	47,785
Copperbelt	0.07	26,099	53,143	58,500
Eastern	0.22	13,925	34,096	38,569
Luapula	0.03	16,203	38,531	41,374
Lusaka	0.04	22,174	44,279	50,470
Northern	0.13	20,370	34,197	37,615
North Western	0.05	17,833	42,801	48,166
Southern	0.22	16,243	41,320	46,630
Western	0.03	12,654	53,018	63,688
All Zambia	1.00	18,630	40,739	45,459
Agro-ecological Zone				
I -Marginally Suitable	0.06	17,145	51,128	59,454
IIa -Suitable	0.64	17,893	39,305	43,682
IIb -Marginally Suitable	0.02	14,835	47,279	57,702
III -Moderately Suitable	0.28	20,956	41,129	45,357
All Zambia	1.00	18,630	40,739	45,459

Source: CSO/MACO Crop Forecast Survey, 2010

Results (4)

Figure 2: Cumulative distribution of production cost



Results (5)

Table 3: Distribution of gross margins for maize production (ZMK/ha)

	Gross Margin Percentiles					Mean
	1	2	3	4	5	
Yield (kg/ha planted)	1,607	1,179	1,675	2,493	4,421	2,275
Price (ZMK/kg)	1,300	1,300	1,300	1,300	1,300	1,300
Gross Revenue (ZMK/ha)	2,088,454	1,532,097	2,177,930	3,241,058	5,746,974	2,957,341
<i>Costs (ZMK/ha)</i>						
Hired animal use	107,787	97,186	88,822	79,808	73,801	89,482
Hired machine use	6,705	3,107	3,100	3,402	7,246	4,712
Hired labor	200,150	117,093	100,705	156,141	198,715	154,568
Basal	172,599	86,033	92,777	150,319	233,677	147,088
Top dressing	180,470	92,968	97,821	156,085	225,662	150,608
Fertilizer transport	9,579	4,277	4,080	7,479	9,545	6,993
Transport to FRA	13,349	6,934	13,949	28,454	67,175	25,973
Transport to other buyer	56,652	13,882	17,570	28,969	36,507	30,719
Herbicides	1,523	579	1,606	1,559	2,996	1,653
Seed	275,545	117,949	117,387	166,048	230,332	181,466
Family labor	2,559,361	949,405	930,752	815,579	776,116	1,206,384
Own animal use	74,089	70,904	59,362	56,068	50,354	62,156
Own machine use	1,774	450	1,755	777	2,346	1,421
Total costs excl' land	3,436,075	1,351,404	1,312,816	1,444,282	1,698,510	1,848,799
Gross margins (ZMK/ha)	-1,347,620	180,692	865,113	1,796,776	4,048,464	1,108,542

Source: MACO/CSO Crop Forecast Survey, 2010.

Results (6)

Regression Highlights

- I. Ecological conditions
 - a. Zones IIa and III are the lowest cost producers
 - b. Rainfall is significant
- II. More educated households earn more from their land

Results (7)

Regression Highlights continued

- III. Tillage Matters
 - a. Plowing, Ripping, Zero Tillage, Basin Planting, and Ridging methods show signs driving up gross margins and/or decreasing cost per bag.
 - b. Pre-rain planting (less than a third of all fields) does not show signs of being economically advantageous *if labor is valued at market wages.*

Results (8)

Regression Highlights continued

IV. Fertilizer increases returns

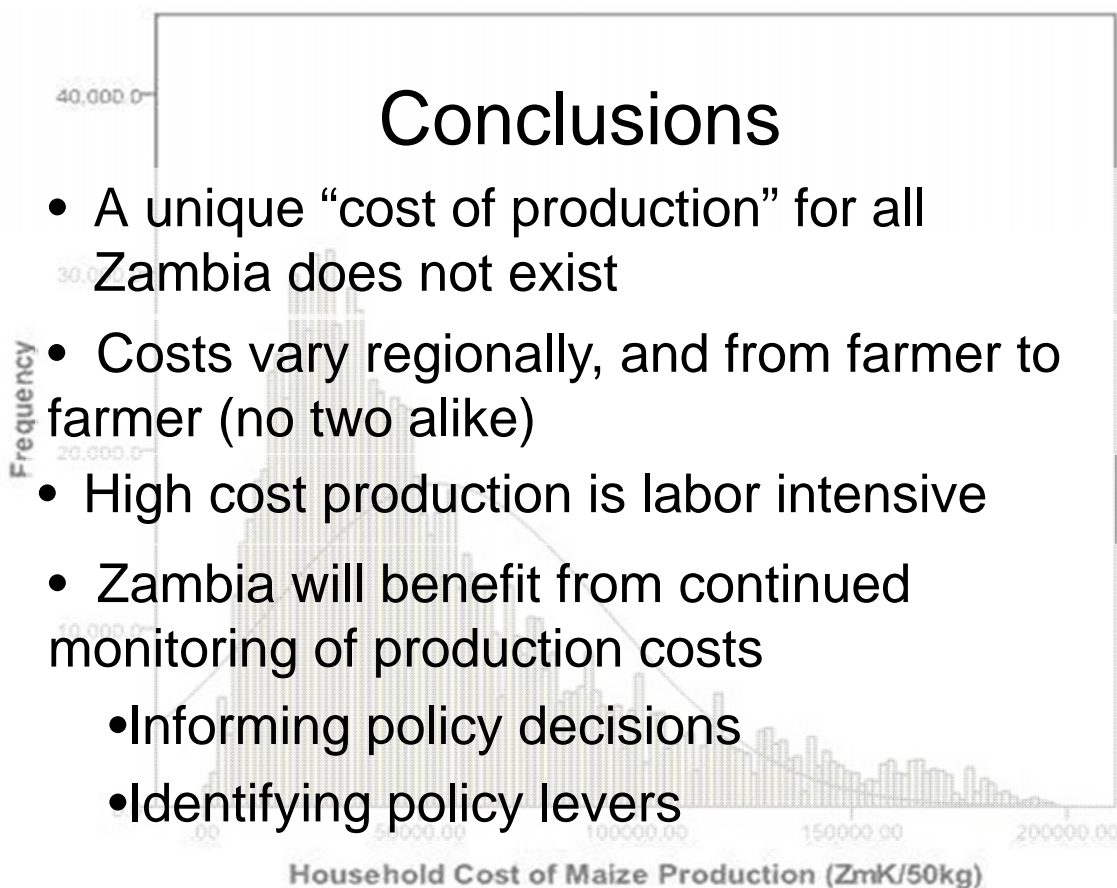
- a. Fertilizer use puts *upward* pressure on gross margins and the returns to labor
- b. At average application rates and FRA buying price gross margins are roughly ZMK 230,000 per hectare greater on fertilized fields

V. Herbicides lower costs

- a. Labor saving/productivity enhancing
- b. Cost of production is roughly ZMK 5,000 lower per bag and gross margins per hectare (at the FRA buying price) are ZMK 375,000 greater when herbicides are used

Conclusions

- A unique “cost of production” for all Zambia does not exist
- Costs vary regionally, and from farmer to farmer (no two alike)
- High cost production is labor intensive
- Zambia will benefit from continued monitoring of production costs
 - Informing policy decisions
 - Identifying policy levers



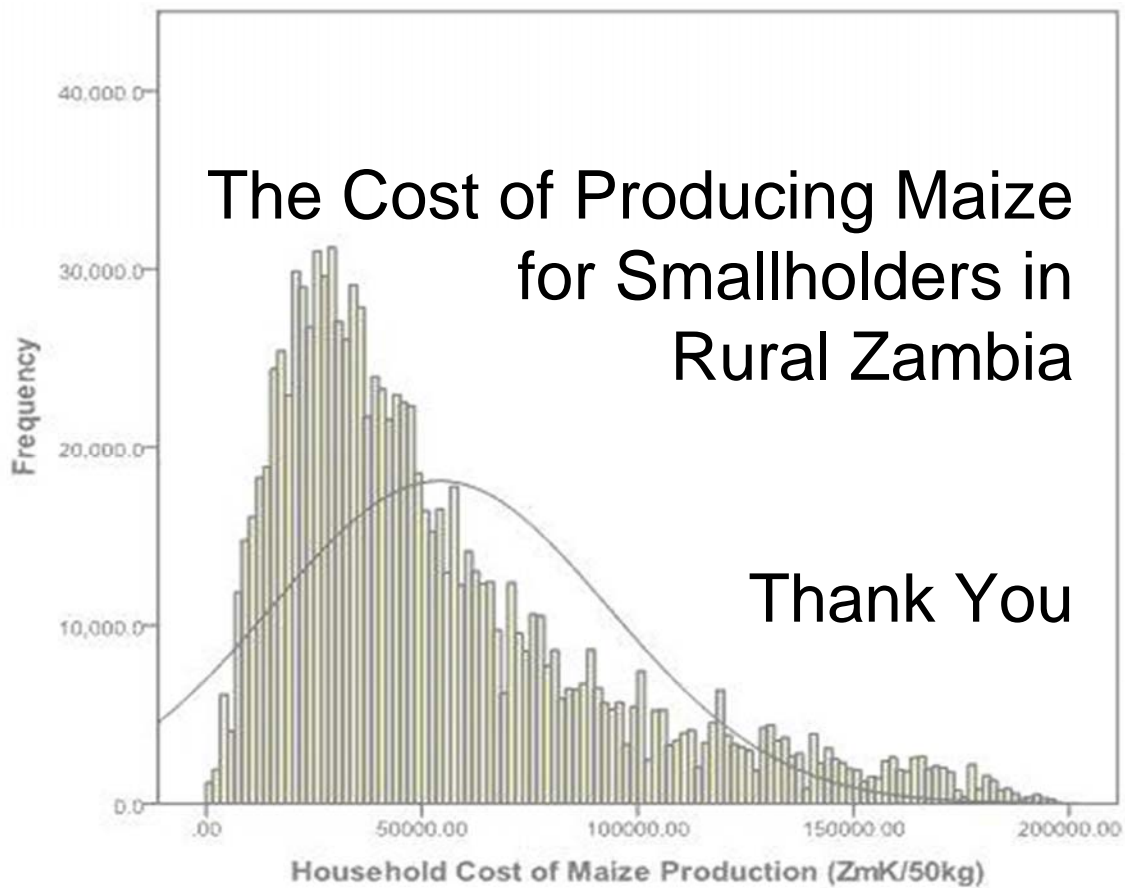


Table 4: Distribution of adult equivalent family labor hours per activity per hectare

Production Activity	Percentile					Mean
	10	25	50	75	90	
Land preparation	0	11	90	301	650	247
Planting	10	24	52	103	219	94
Basal dressing application	0	0	0	32	79	28
Top dressing application	0	0	0	32	80	30
First weeding	0	47	143	298	531	231
Second weeding	0	0	0	103	277	93
Third weeding	0	0	0	0	0	17
Harvesting	10	42	102	203	375	167
Transport (field to homestead)	0	13	46	124	260	106
Shelling and Packing	0	31	91	216	417	175

Source: CSO/MACO Crop Forecast Survey, 2010

Table 5: Distribution of returns to labor days per hectare planted

Revenue	Returns to Labor Quintiles					Mean
	1	2	3	4	5	
Yield (kg/ha planted)	1,282	1,720	2,112	2,618	3,573	2,261
Price (ZMK/kg)	1,300	1,300	1,300	1,300	1,300	1,300
Gross Revenue (ZMK/ha)	1,666,998	2,235,686	2,746,225	3,403,496	4,645,496	2,939,637
Costs (ZMK/ha)						
Hired animal use	111,541	70,919	81,838	89,496	96,437	90,045
Hired machine use	7,434	1,986	3,014	3,129	7,656	4,644
Hired labor	211,777	81,440	92,753	124,204	201,691	142,370
Basal	172,725	94,266	121,997	141,511	191,926	144,483
Top dressing	174,741	106,863	124,130	145,070	190,268	148,213
Fertilizer transport	9,706	4,218	5,148	6,285	8,935	6,858
Transport to FRA	13,584	12,301	18,940	32,758	47,669	25,051
Transport to other buyer	52,898	11,288	17,975	24,216	44,194	30,113
Herbicides	1,570	346	1,720	1,226	3,059	1,584
Seed	262,520	123,309	147,688	161,964	199,423	178,977
Own animal use	76,710	50,061	56,232	61,976	68,726	62,740
Own machine use	1,742	204	1,659	715	2,764	1,417
Costs excl' land/hh labor	1,096,947	557,199	673,093	792,549	1,062,748	836,494
Net revenue (ZMK/ha)	570,051	1,678,487	2,073,132	2,610,947	3,582,748	2,103,143
HH labor days (days/ha)	394	348	229	156	79	241
Return: labor & land (ZMK/day)	-875	4,966	9,216	17,206	75,560	21,217
Land cost (ZMK/ha/year)	221,908	218,356	215,410	211,929	203,514	214,223
Costs excl' hh labor	1,318,854	775,555	888,503	1,004,479	1,266,262	1,050,717
Net Revenue (ZMK/ha)	348,143	1,460,131	1,857,722	2,399,018	3,379,234	1,888,920
Return : labor (ZMK/ day)	-2,666	3,850	7,683	15,198	70,146	18,844

Source: MACO/CSO Crop Forecast Survey, 2010.

Figure 4: National distribution of profit per 50kg bag at ZMK 65,000/bag sale price

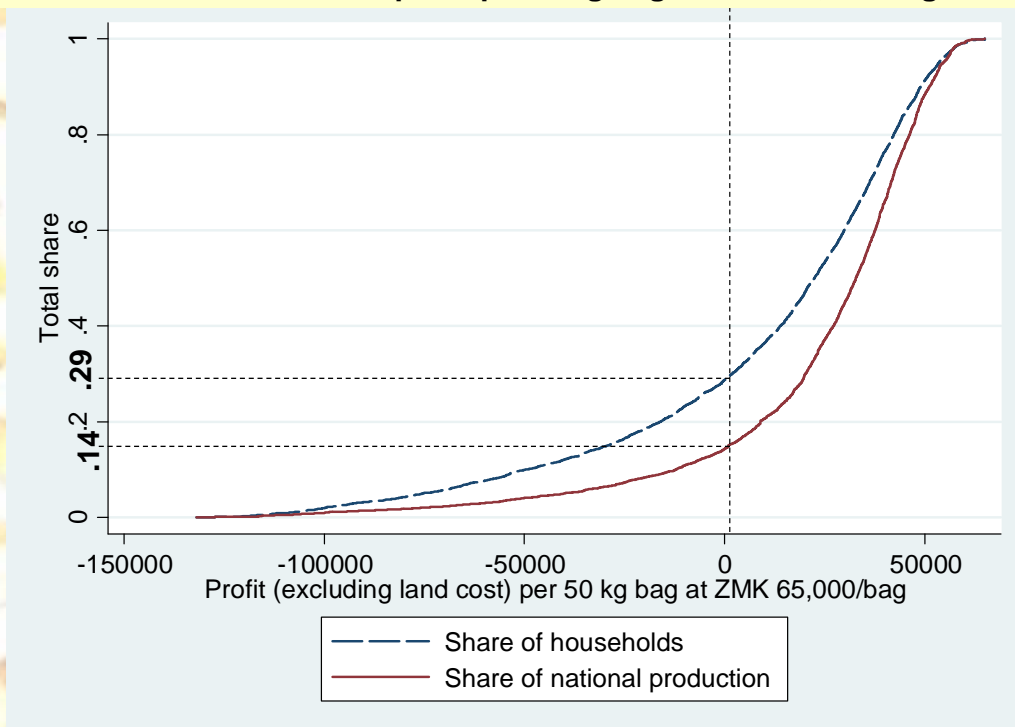


Table 7: Profit per hectare of maize production by province

Province	Total maize profit (ZMK)	Hectares planted	Profit per hectare (ZMK/ha)
Central	215,897,973,871	187,019	1,154,417
Copperbelt	40,864,409,155	77,462	527,540
Eastern	326,853,442,781	284,183	1,150,151
Luapula	34,909,023,448	27,943	1,249,274
Lusaka	36,248,607,230	32,028	1,131,769
Northern	187,590,528,628	111,132	1,687,995
North Western	56,120,979,487	61,420	913,723
Southern	250,840,182,271	243,944	1,028,270
Western	19,194,798,374	62,549	306,877
All Zambia	1,168,519,945,244	1,087,681	1,074,322

Source: CSO/MACO Crop Forecast Survey 2010

Note: Profit is calculated as ZMK 65,000 less total expenditures including family labor and asset use.

Table A1: Median hourly wage by province for maize related production activities

	Province								
	Central	Copperbelt	Eastern	Luapula	Lusaka	Northern	N. Western	Southern	Western
Land preparation	1,500	1,389	1,375	1,195	1,333	823	677	3,000	1,667
Planting	1,771	1,615	972	781	2,000	833	1,042	2,500	945
Basal Dressing	1,615	1,458	690	1,000	1,833	833	1,486	1,949	408
Top Dressing	1,615	1,339	714	1,000	2,083	817	1,417	1,667	333
1st Weeding	863	952	866	762	1,042	578	583	732	722
2nd Weeding	967	774	625	732	955	500	521	950	528
3rd Weeding	476	476	862	694	1,042	440	419	536	323
Harvesting	938	714	690	586	938	670	732	458	833
Transporting to homestead	2,500	1,667	2,241	741	1,333	625	833	2,232	2,500
Shelling and Packing	804	833	525	567	670	469	760	1,000	600

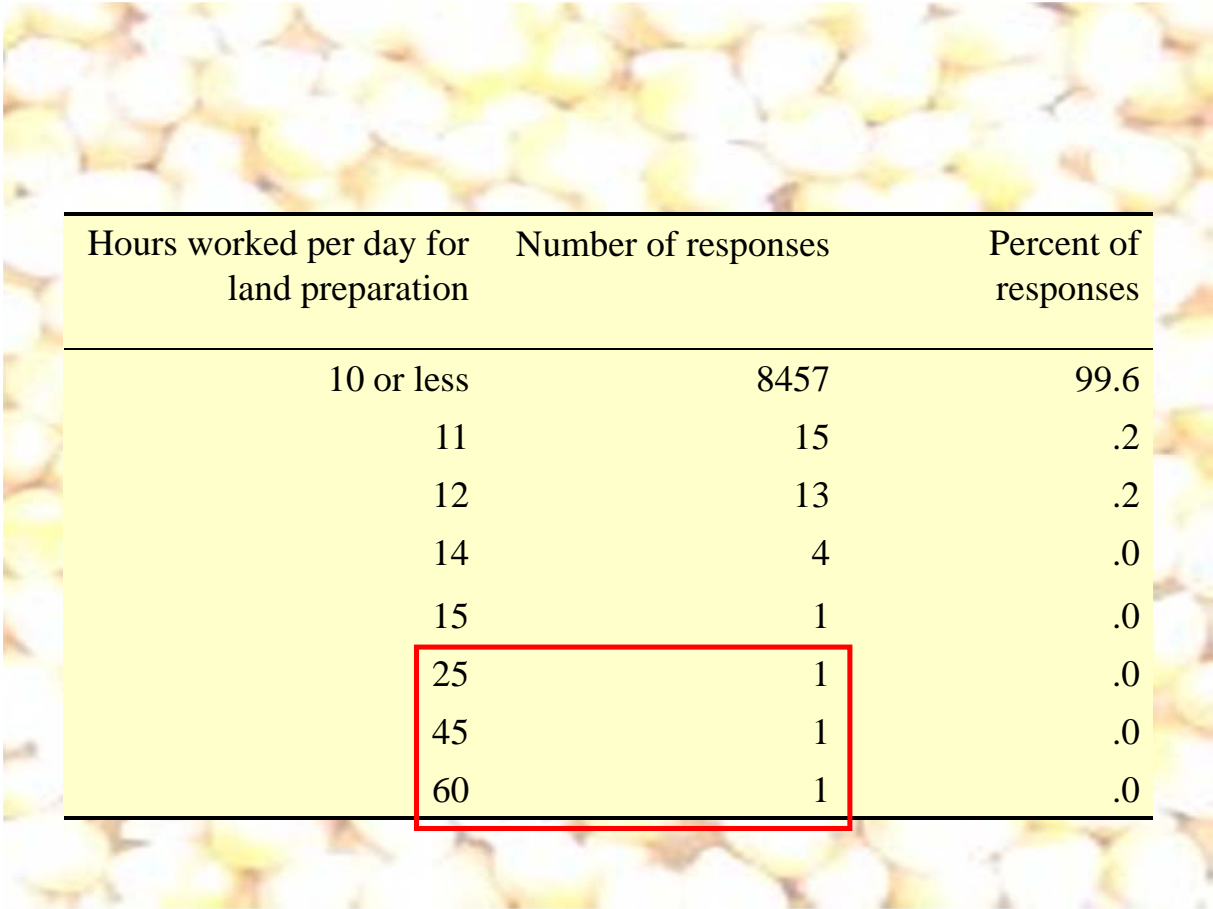
Source MACO/CSO Crop Forecast Survey, 2010

Table B: Maximum accepted response for various labor-related questions

Variable	Maximum value	% of valid activity-level responses affected	% of all activity-level responses affected
Number of employees hired	20 workers	0.7%	0.0%
Days each hire is employed	Land Prep: 60 days Other: 30 days	0.0%	0.0%
Time worked per employee per day	10 hours	1.2%	0.0%
Number of working household men	Determined by demographics data	19.1%	12.5%
Number of working household women	Determined by demographics data	19.8%	13.0%
Number of working household boys	Determined by demographics data	5.1%	3.4%
Number of working household girls	Determined by demographics data	4.1%	2.7%
Days household members worked	Land Prep: 60 days Other: 30 days	0.7%	0.0%
Time worked per member per day	10 hours	0.8%	0.0%

Gross Margins by Geography and Fertilizer Use

	Do not use fertilizer		Use fertilizer	
	Gross margins (ZMK/ha)			
	Median	Mean	Median	Mean
Central	506,157	745,974	1,208,387	1,349,719
Copperbelt	248,933	482,098	226,667	703,013
Eastern	737,180	947,913	1,126,100	1,547,810
Luapula	807,961	768,189	1,715,615	1,638,932
Lusaka	349,666	394,590	1,101,934	1,247,308
Northern	1,189,934	1,372,624	2,238,054	2,143,883
North Western	725,217	878,397	1,155,001	1,269,177
Southern	464,813	736,449	720,234	1,038,664
Western	149,939	173,962	265,432	832,002
<i>Agro-zones</i>				
AEZ 1	280,679	232,286	679,203	903,701
AEZ 2a	671,920	907,897	1,117,396	1,377,295
AEZ 2b	330,699	309,676	265,432	831,609
AEZ 3	820,177	967,189	1,561,330	1,588,823
All Zambia	624,503	796,890	1,208,387	1,425,744



Hours worked per day for land preparation	Number of responses	Percent of responses
10 or less	8457	99.6
11	15	.2
12	13	.2
14	4	.0
15	1	.0
25	1	.0
45	1	.0
60	1	.0