

Analysis of the 2009/10 Maize Production Estimate from the Crop Forecast Survey



FSRP/ACF and MACO/Policy and Planning Department
Presentation at Mulungushi, House, Lusaka
28 June 2010

Major Issues Covered in this Presentation

1. Is the CFS maize production estimate for 2009/10 accurate?
2. If so, what factors account for the increased maize production in 2009/10?
3. Did overall crop output in 2009/10 increase?
 - Did the rise in maize production reflect a rise in overall agricultural production?...or
 - Did smallholders substitute area and labor out of other crops into maize?

Question #1:

Is the CFS maize production estimate for 2009/10 accurate?

CFS Data/Analysis Strengthening

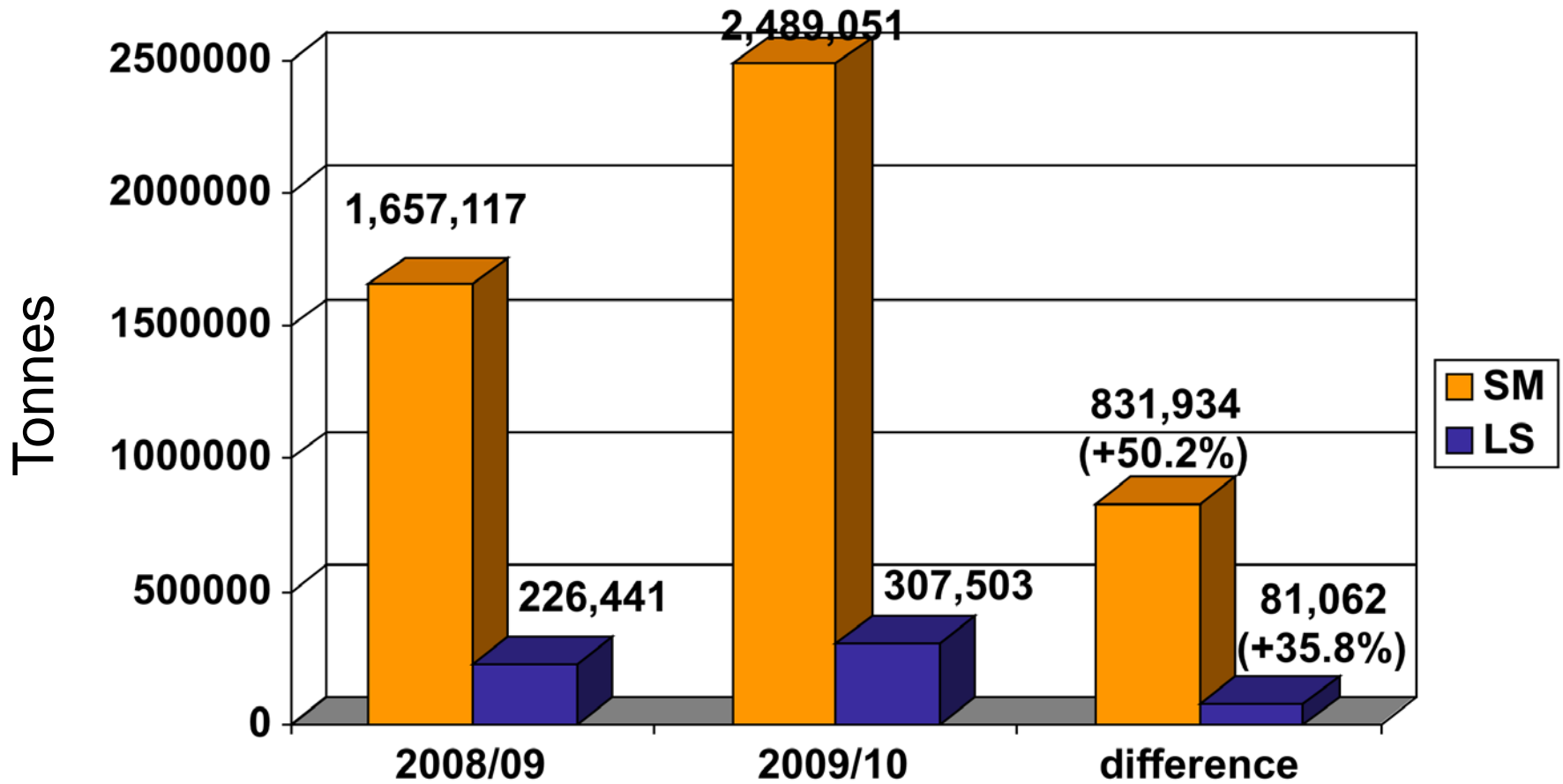
- Past 3-5 yrs CSO/MACO has invested to improve the quality/size of the CFS survey
 - Sample size increase
 - Increased effort on data verification/consistency checks
 - Beginning with 2008/09 CFS, improved the sample weighting scheme to be more consistent with CSO rural population info
 - Closer coordination with the Stocks Committee/Private sector
- External checks of consistency of CFS data done with seed sales, FRA procurement volumes, weather and production/marketing patterns in other surveys

MACO/CSO Role in the CFS

- CSO/MACO Hq. staff
- Master trainers and Province staff involved in data collection; master trainers also involved in data cleaning



2008/09 vs. 2009/10 CFS Maize Production Estimates



Question #2:

What factors account for the increased maize production in 2009/10?

Contributions to Growth

Production change = (Yield) + (Ratio of harvested area) + (Area planted)

can be attributed to

effects from

Definitions

prod=production

y=yield

ah=area harvested

ap=area planted

Δ =change

Mathematically

$$prod = y \cdot ah = y \cdot \frac{ah}{ap} \cdot ap$$

$$\frac{\Delta prod}{\Delta prod} = \frac{\Delta y \left(\frac{ah}{ap} \cdot ap \right)}{\Delta prod} + \frac{\Delta \frac{ah}{ap} (y \cdot ap)}{\Delta prod} + \frac{\Delta ap \left(y \cdot \frac{ah}{ap} \right)}{\Delta prod}$$

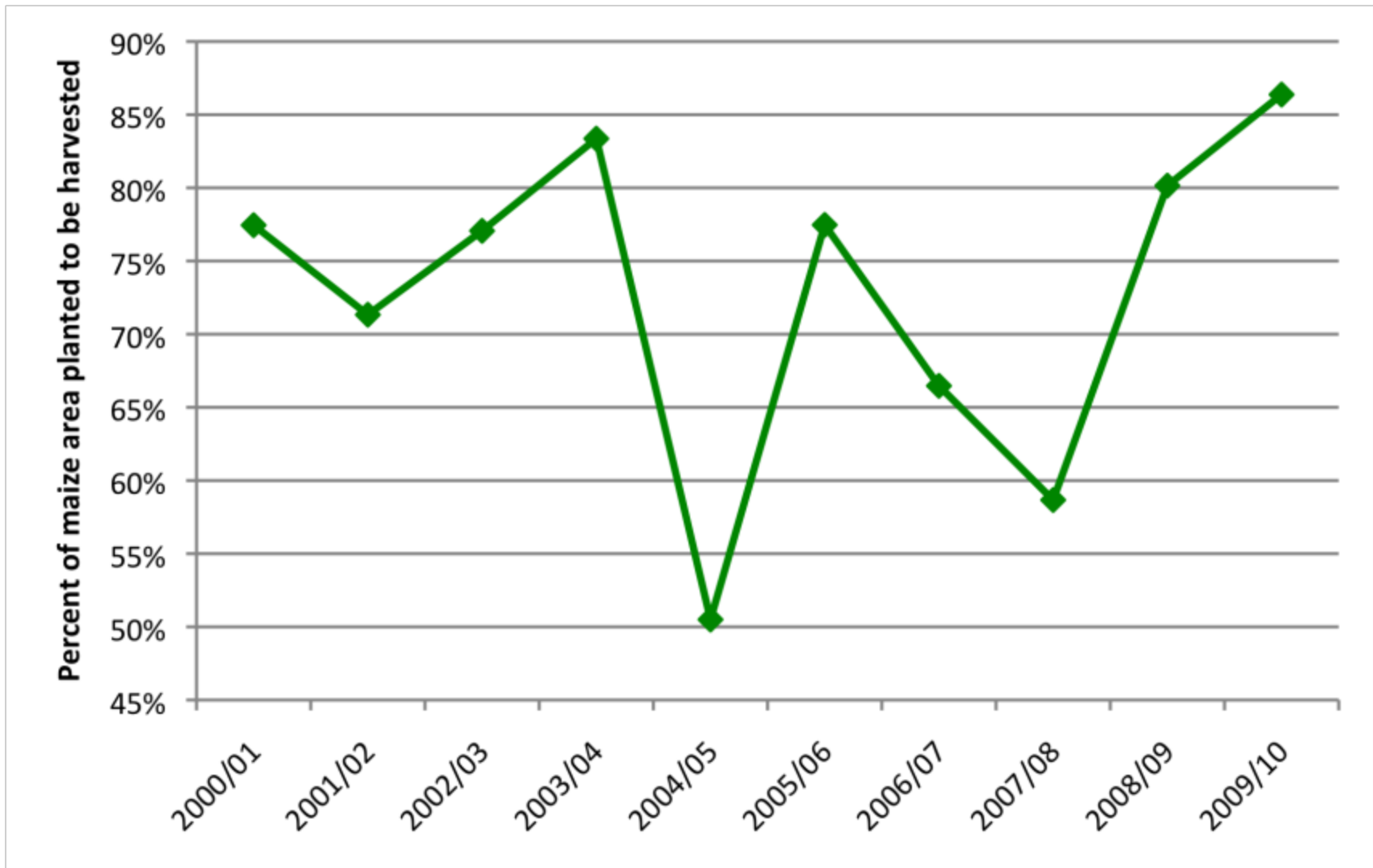
Contributions Within Each Province to Production Growth

Province	% relative contribution to production growth between 2009-2010 harvests from changes in		
	Yield	Ratio of Harvested to Planted Land	Area Expansion
Central	45	24	31
Copperbelt	47	2	51
Eastern	102	0	-2
Luapula	59	1	40
Lusaka	51	16	32
Northern	39	1	60
Northwestern	56	7	37
Southern	45	31	24
Western	47	58	-4
All Zambia	59	18	23

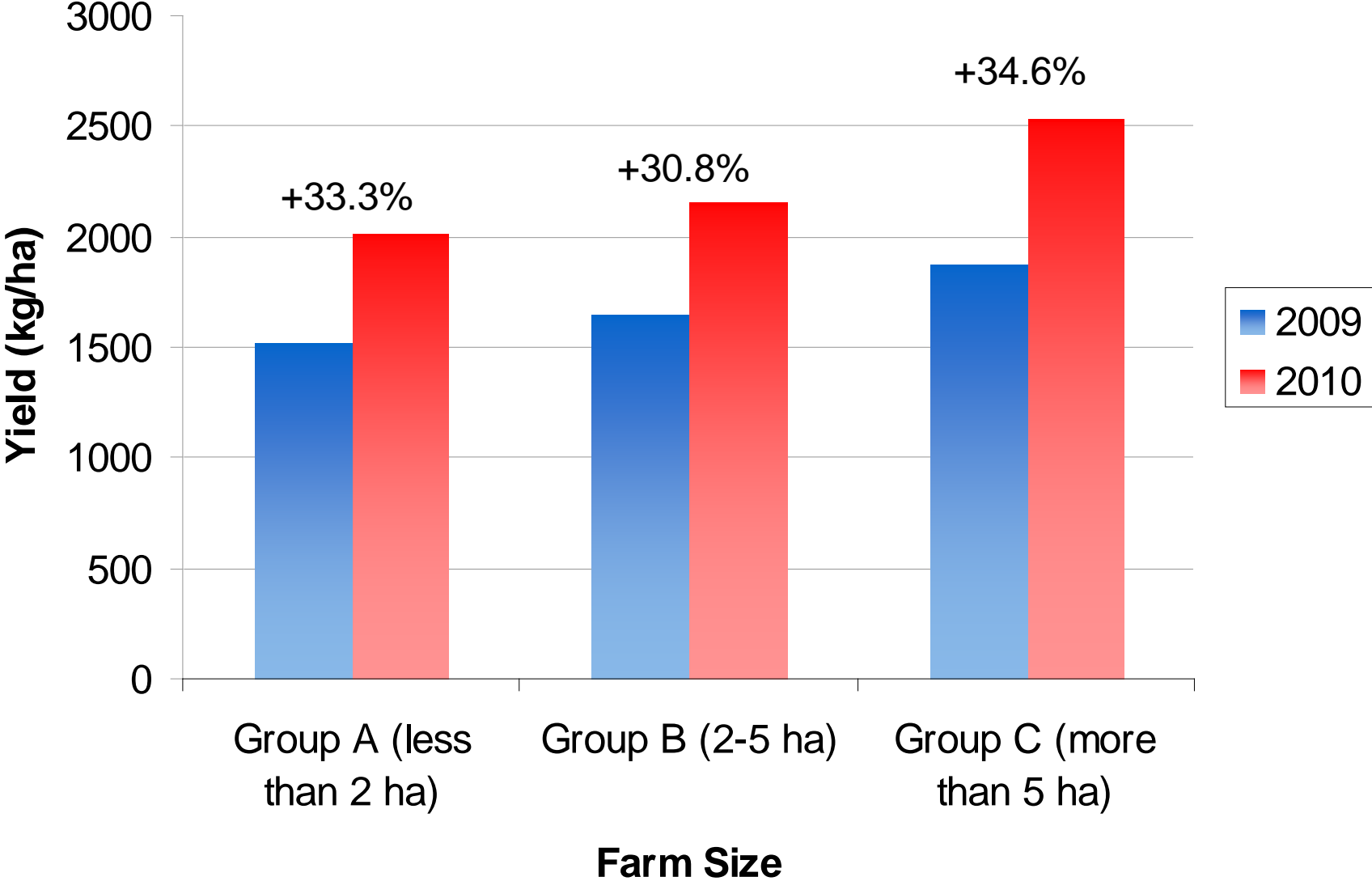
Source: Central Statistics Office Crop Forecast Survey 2008/09, 2009/10

Note: Rows sum to 100

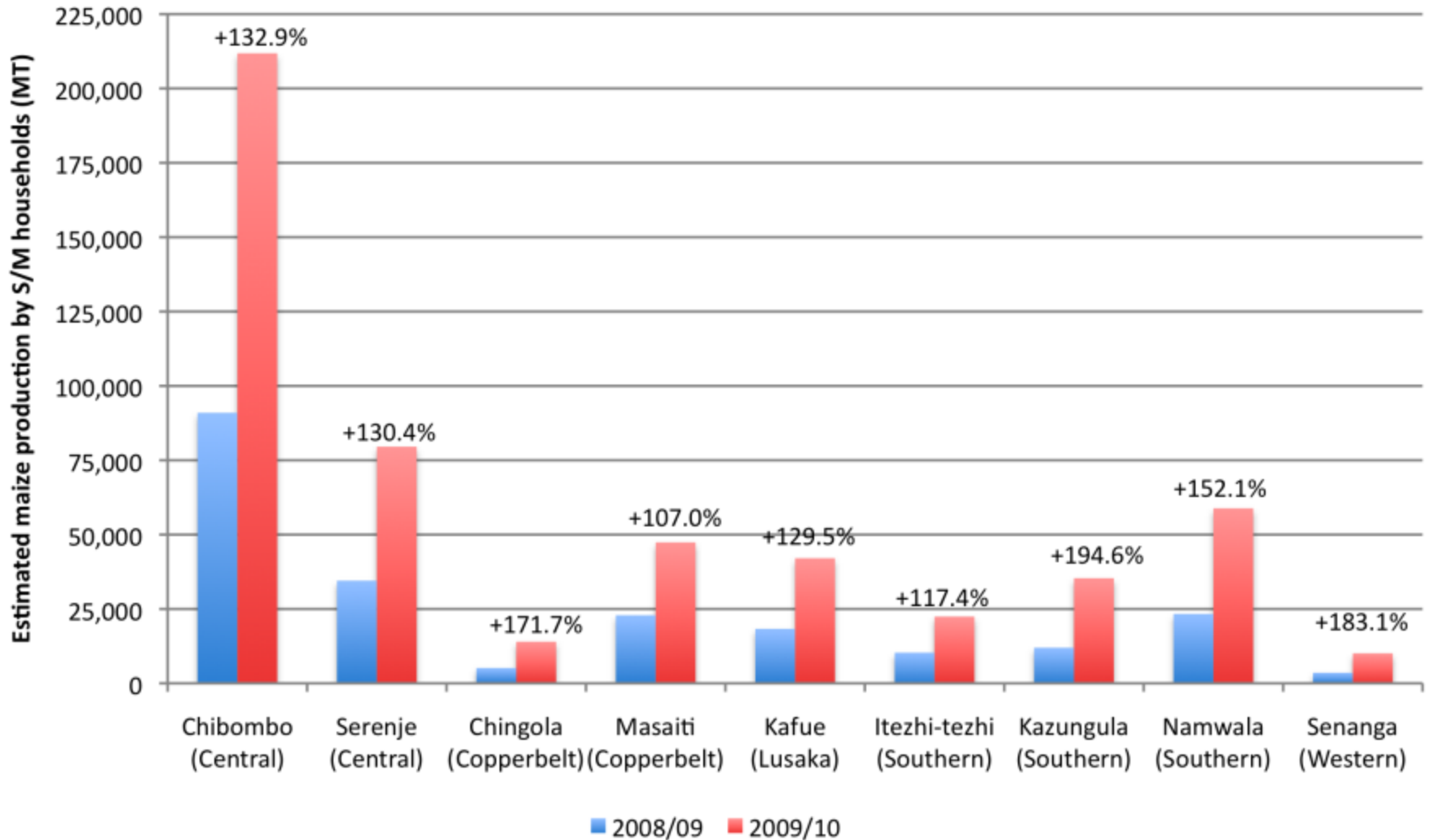
Percent of maize area planted to be harvested, 2000/01-2009/10



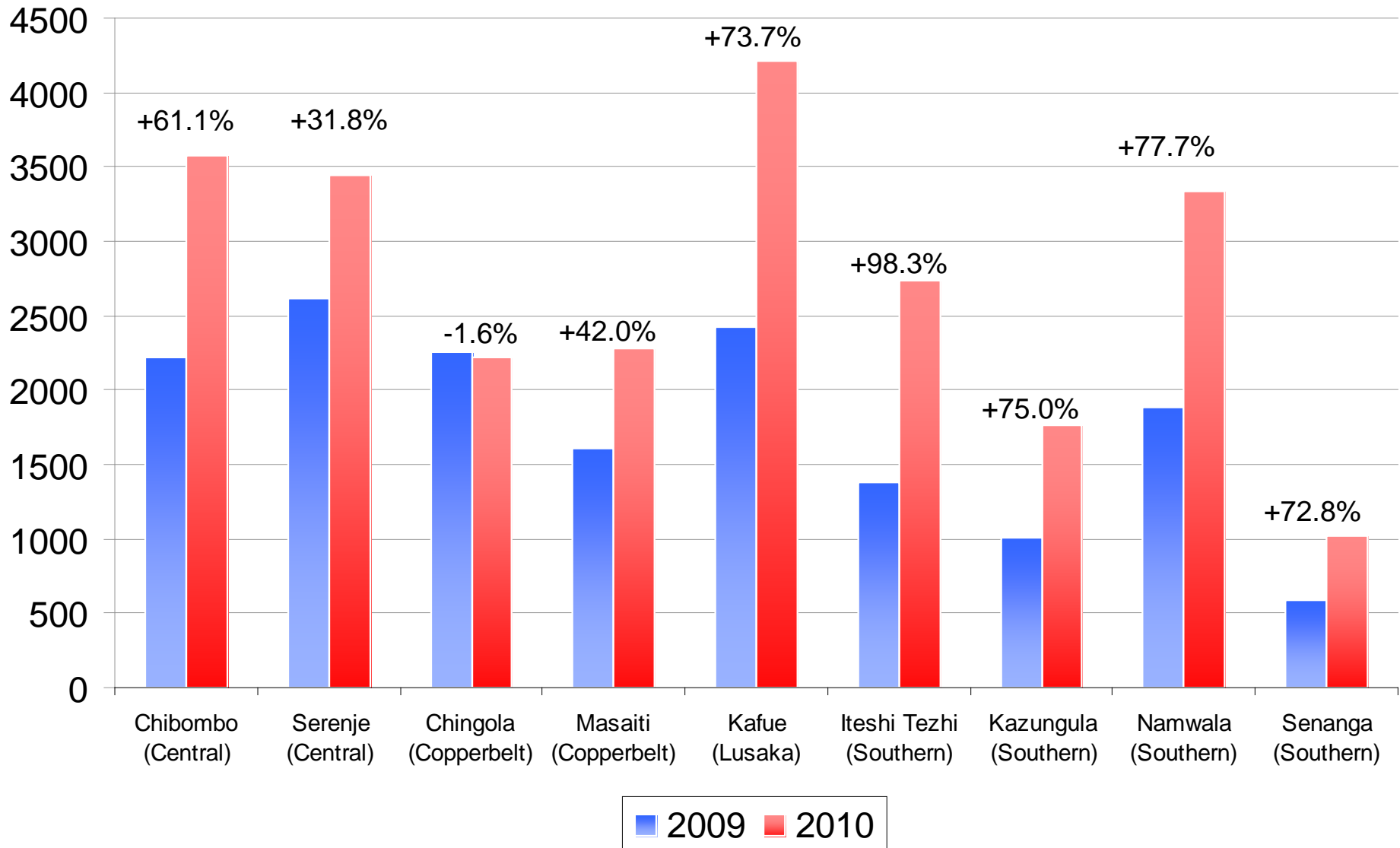
Changes in Yield by Farm Size Category



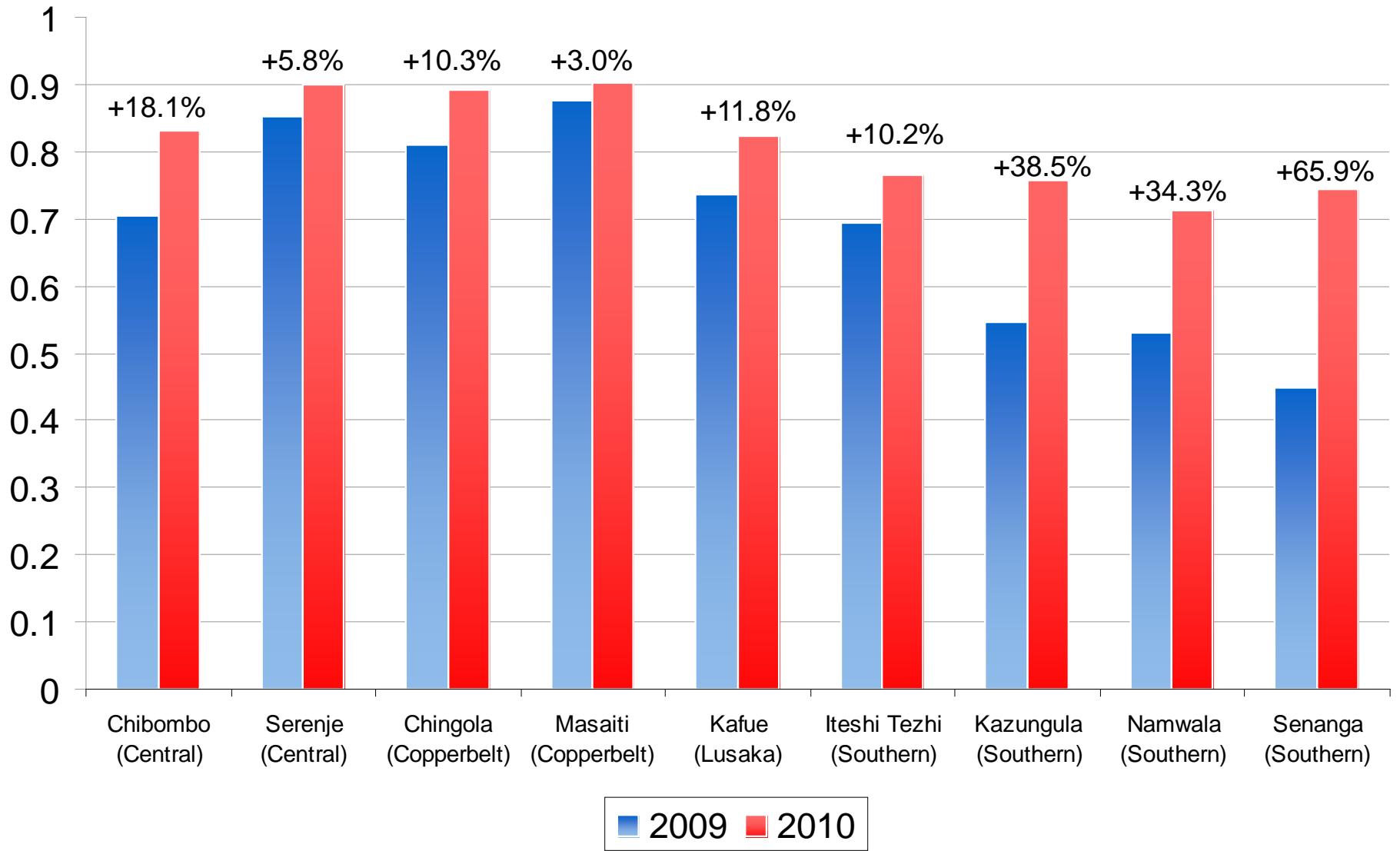
In 9 districts, 2009/10 expected total S/M maize production more than double 2008/09 level



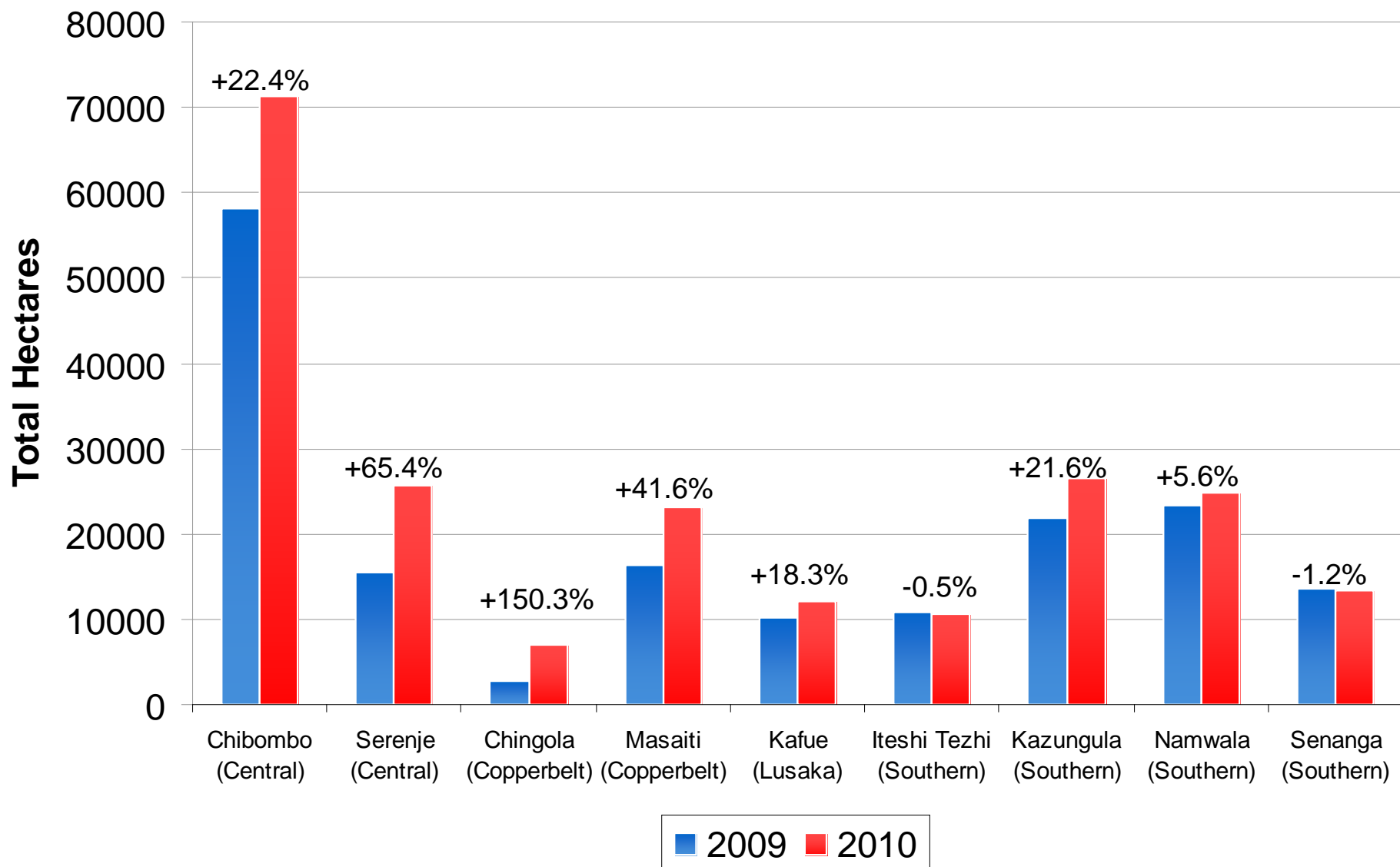
Yield (kg/ha) changes for 9 Districts



Ratio of Harvested to Planted Area in 9 districts



Total area planted to maize for 9 districts



Increase in 2009/10 maize output due to increased fertilizer use

	Fertilizer applied on maize (mt)	response rate per kg fertilizer	Incremental maize output due to fertilizer (mt)
2008/09	115,517	3.0kg mz	346,551
		4.0kg mz	462,068
		5.0kg mz	577,585
2009/10	167,200	3.0kg mz	501,600
		4.0kg mz	668,800
		5.0kg mz	836,000
difference	51,683	3.0kg mz	155,049
		4.0kg mz	206,732
		5.0kg mz	258,415

- Therefore, roughly 200,000 to 250,000 of the 831,934 tons of incremental maize production (25% to 30%) can be attributed to increased fertilizer use in 2009/10 compared to 2008/09.

Increase in 2009/10 maize output due to expected increase in maize price:

	Price expectation based on prior year price (May-Oct): Market / FRA	% Δ Qmz / % Δ Pmz	Incremental maize output due to change in expected mz price
2008/09	943 / 1100 kw/kg		
2009/10	1205 / 1300 kw/kg		
difference	+28% / +18%	+0.3 +0.5	83,000 to 232,000 mt

- Therefore, roughly 83,000 to 232,000 of the 831,934 tons of incremental maize production (10% to 28%) can be attributed to expectation of increased maize price in 2009/10 compared to 2008/09.

Increase in 2009/10 maize output due to increased hybrid maize seed use:

	% of maize area planted to hybrid maize seed	% yield increase in hybrid seed vs. non-hybrid	Incremental maize output due to change in use of hybrid maize seed
2008/09	39%		
2009/10	46%		
difference	7%	20% 30%	22,000 to 31,000 mt

- Therefore, roughly 22,000 mt to 31,000 mt of the 831,934 tons of incremental maize production (2.6% to 3.7%) can be attributed to increased use of hybrid maize seed in 2009/10 compared to 2008/09.

Conservation Farming

- Highly effective
- Yield response to fertilizer is 2x greater using planting basins
- Not enough adoption to affect national production
 - CFS data not designed to sufficiently analyze the contribution of CF on maize production growth at national level.
 - Initial estimates indicate minimal contribution of CF to the growth in national production

% of increased 2009/10 maize output (831,934 mt) attributable to:

Increased fertilizer use: (200,000 to 250,000 mt)	25% to 30%
Expectation of increased maize price: (83,000 to 232,000 mt)	10% to 28%
Increased use of hybrid maize seed (22,000 to 31,000 mt)	2.6% to 3.7%
Residual – weather effect	38% to 62%

Regression Analysis

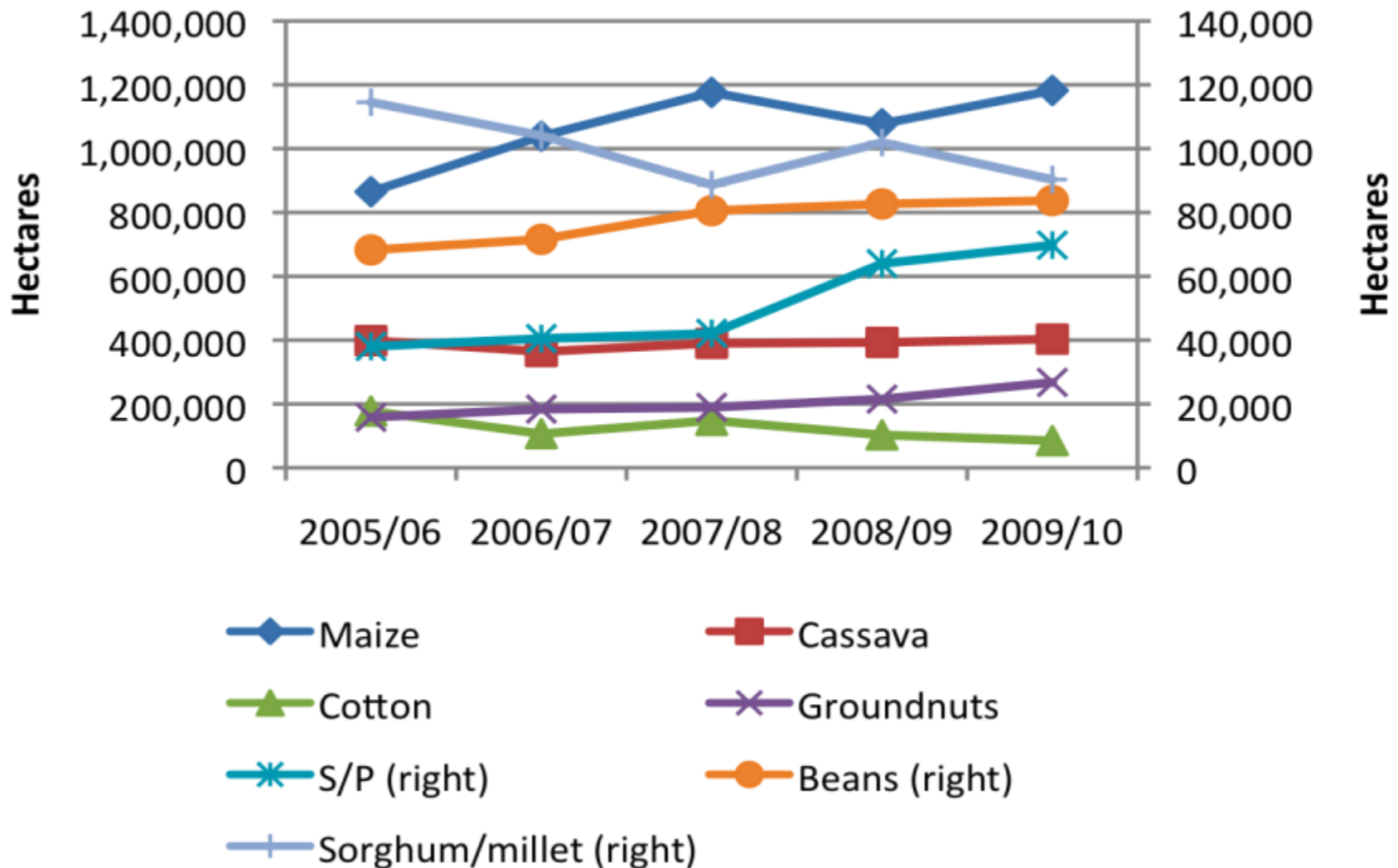
- Yield increase approximately 25%
 - If **only** fertilizer (FISP *and* private sector) changes, increase is 4%
 - If **only** weather changes, increase is 20%
- The majority of the increase in yield can be attributed to fertilizer and weather.

Question #3:

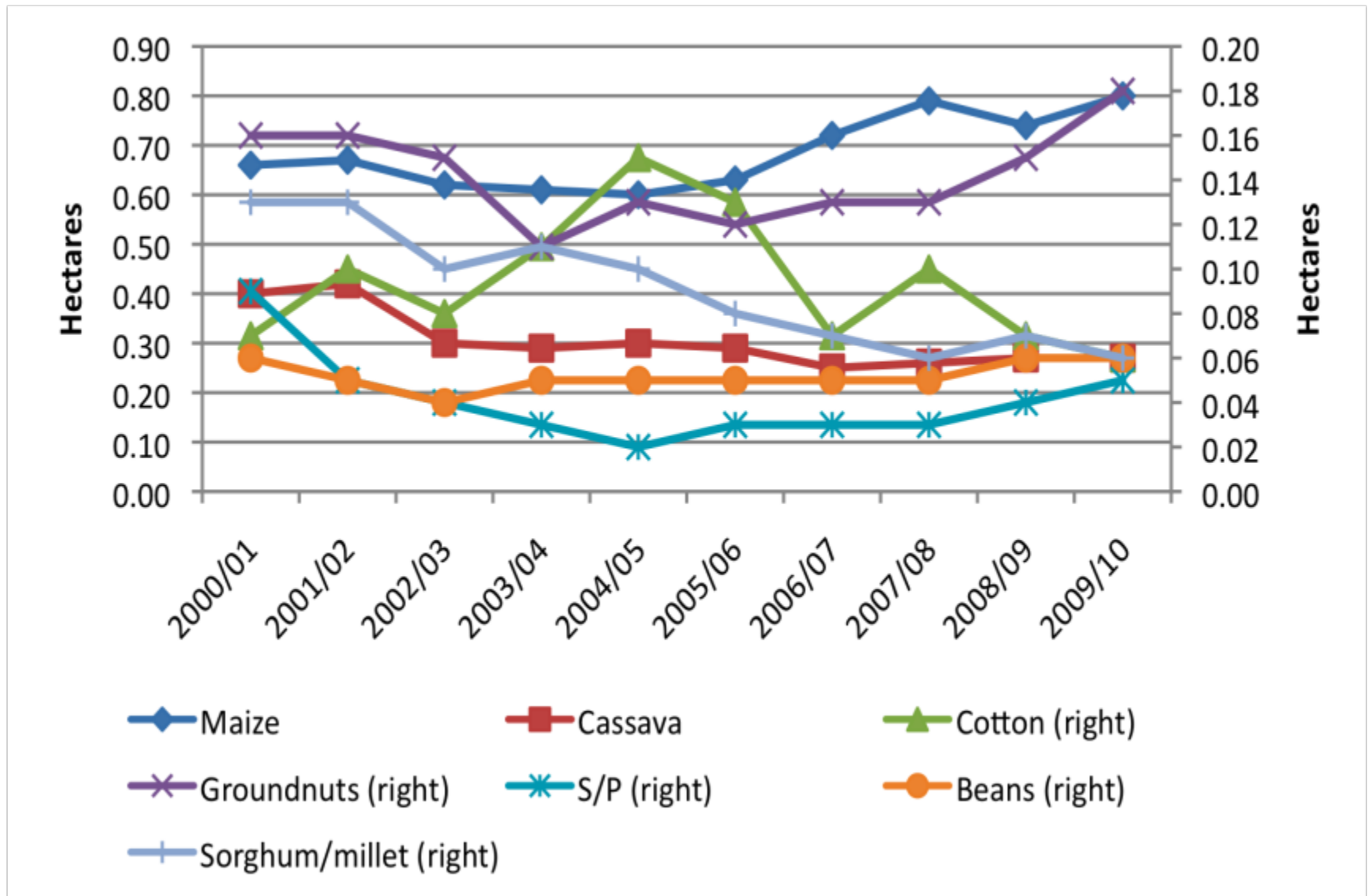
Did overall crop output in 2009/10 increase?

- Did the rise in maize production reflect a rise in overall agricultural production?...or
- Did smallholders substitute area and labor out of other crops into maize?

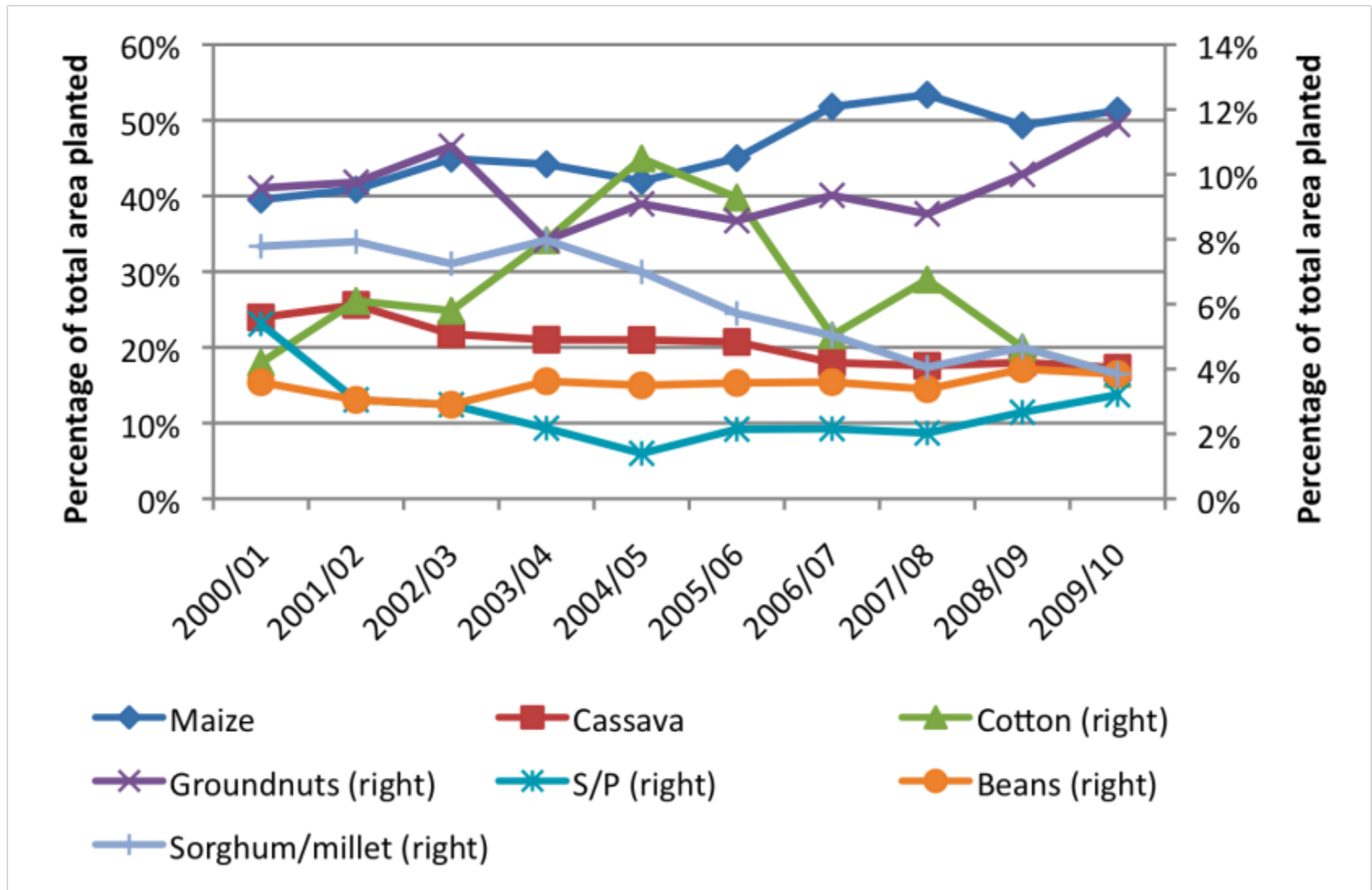
Total area planted by small/medium-scale agricultural households, 2005/06-2009/10



Mean area planted per small/medium-scale agricultural household, 2000/01-2009/10



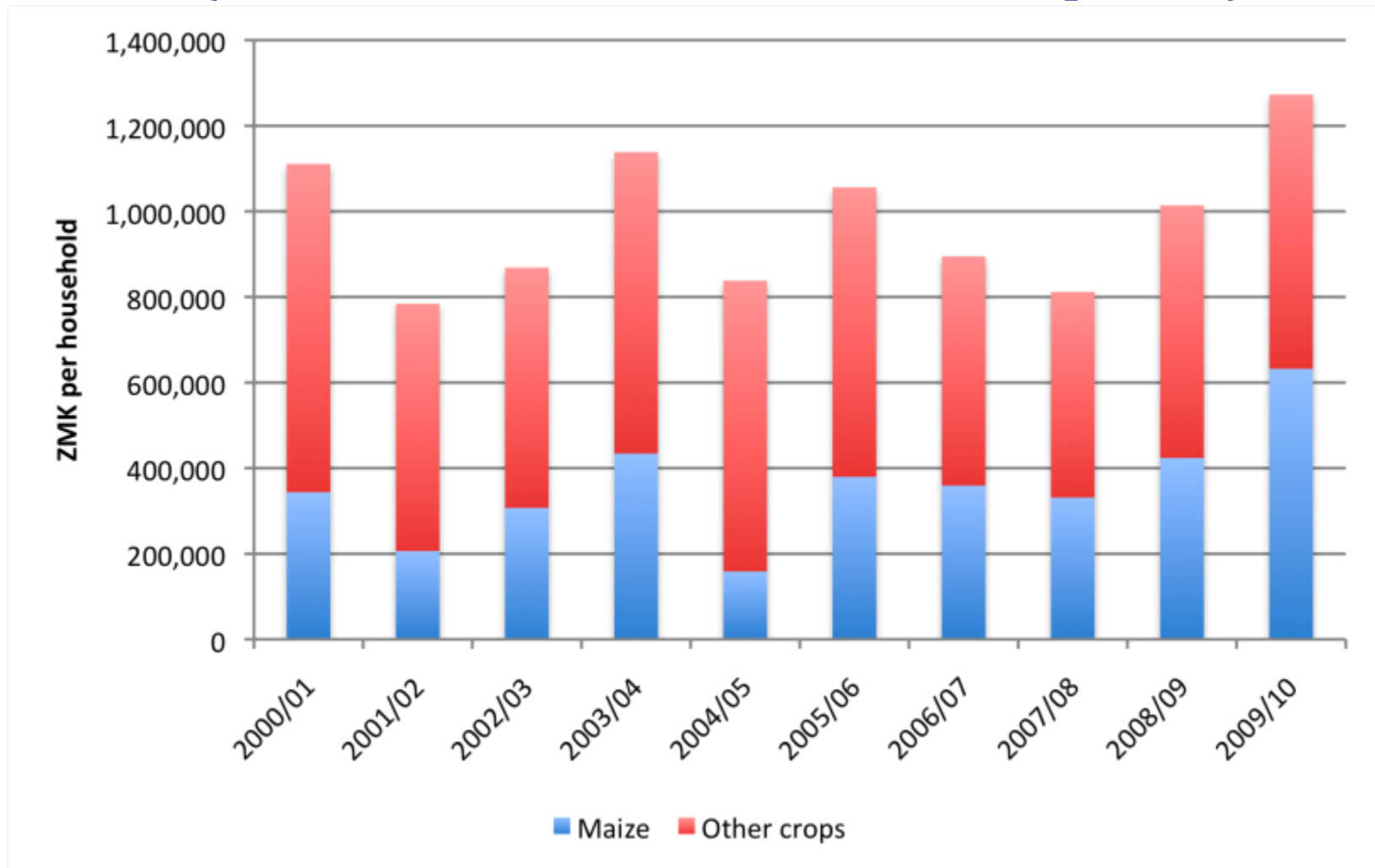
Percentage of total area planted to each crop, S/M agric households, 2000/01-2009/10



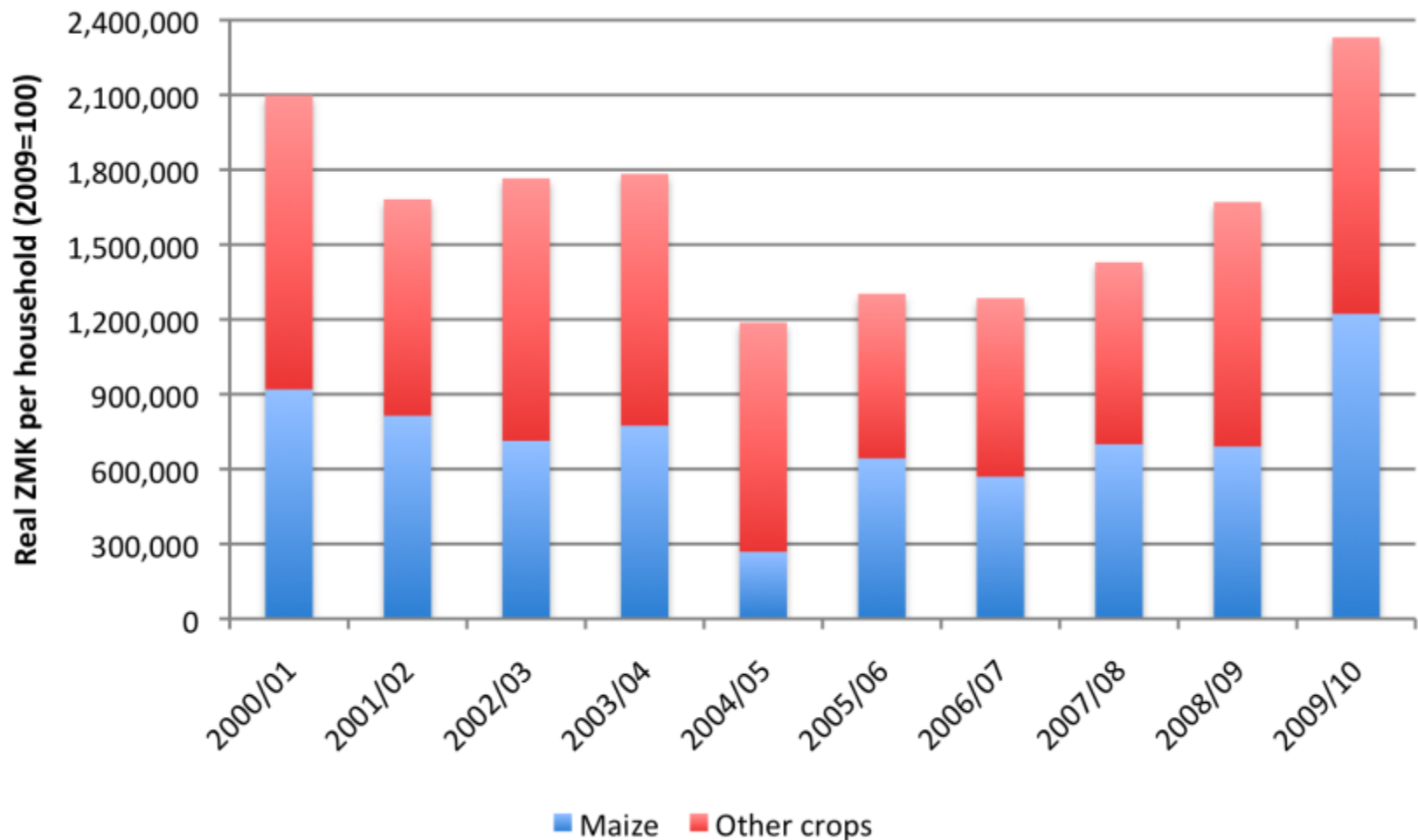
Summary: Total Area planted by S/M households, mean area planted per S/M Ag. household and % area planted to each crop

(Reference period)	Total area planted by s/m farm households (2005/06-2009/10)	Mean area planted per s/m farm household (2000/01-2009/10)	Percent of total area planted to each crop (2000/01-2009/10)
Maize	Increasing since 05/06 (37% higher in 09/10 compared to 05/06)	Slight decline, 00/01-04/05; increasing since 05/06 (highest in 09/10)	Increasing since 05/06 (higher 06/07 to 09/10 ~51%) vs 00/01 to 05/06 ~43%)
Cotton	Declining since 05/06	Declining since 04/05	Declining since 04/05
Cassava	Declining since 05/06	Declining over time	Declining over time
Groundnuts	Increasing since 05/06	-Declining until 03/04 -Increasing since 04/05	-Declining until 03/04 -Relatively stable 04/05-07/08
Sweet Potato	Increasing since 05/06 (largest increase between 07/08 & 08/09)	-Steepest increases between 07/08 and 09/10	-Higher in 08/09 & 09/10
Mixed Beans	Increasing since 05/06	-Stable 03/04 to 07/08 -Increasing since 08/09	Fairly constant over the decade
Sorghum/Millet	Declining since 05/06	Declining throughout decade	Declining throughout decade

Mean value of crop production net of fertilizer costs per small/medium-scale agricultural household (billion ZMK, valued at constant prices)



Mean value of crop production net of fertilizer costs per small/medium-scale agricultural household (billion ZMK, valued at real 2009 prices)



Conclusions:

1. 2009/10 maize production estimate is in the range of plausibility
2. Factors driving the increased maize production:
 - Unusually favorable weather: 38% to 62%
 - Expectation of favorable maize prices / access to FRA: 10% to 28%
 - Increased FISP *and private sector* fertilizer use: 25% to 30%
 - Increased use of hybrid maize seed: 3% to 4%

Conclusions:

4. Overall increase in net value of crop production in 2009/10 – the highest crop performance in past 10 years.
5. Some substitution out of cotton and to a lesser extent, cassava, but outweighed by huge increase in maize production
6. Trends over 2000/01 to 2009/10: mean area planted per ag household to cassava, cotton and sorghum and millet generally declines as maize area has increased.

Conclusions:

7. Mean household area to sweet potato and groundnut declined during first part of decade, but has risen in recent years
8. Though Zambia had a good harvest in 2010, the country remains vulnerable to shifts in weather conditions. What can be done to further limit the contribution of weather to changes in production?

Acknowledgements

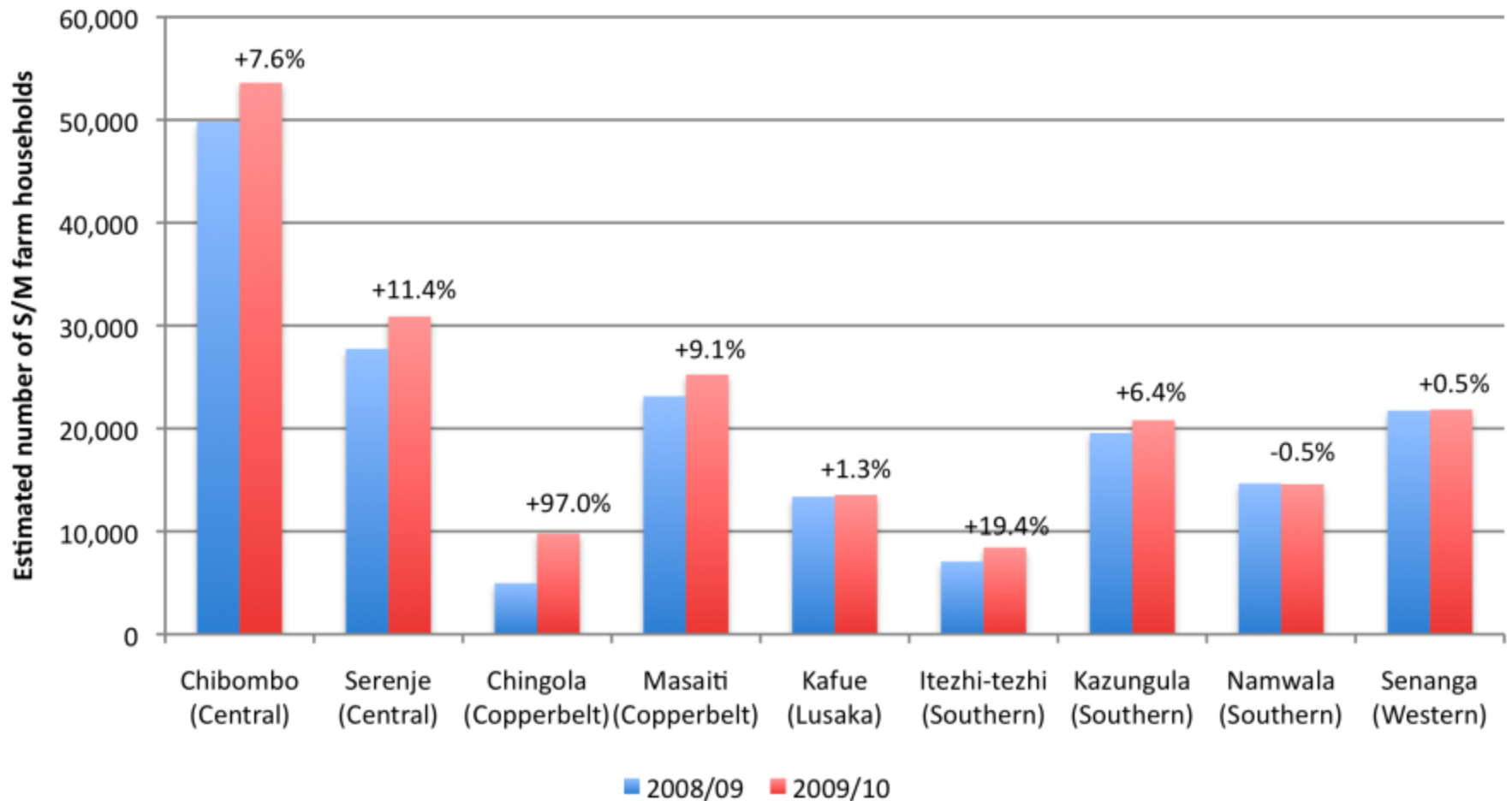
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Thank you

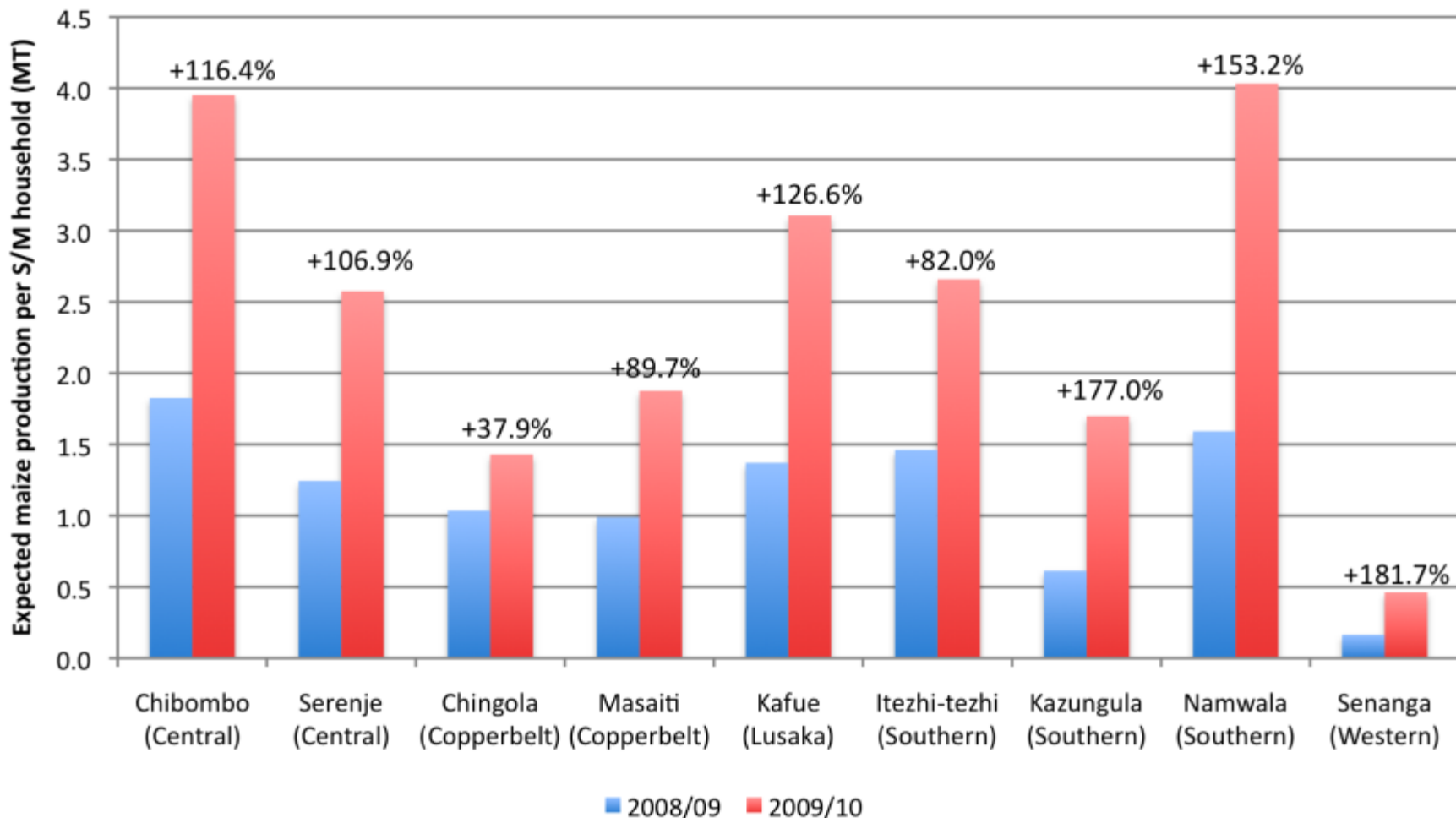


Bonus Slides

Number of S/M agricultural households in these 9 districts, 2008/09 and 2009/10



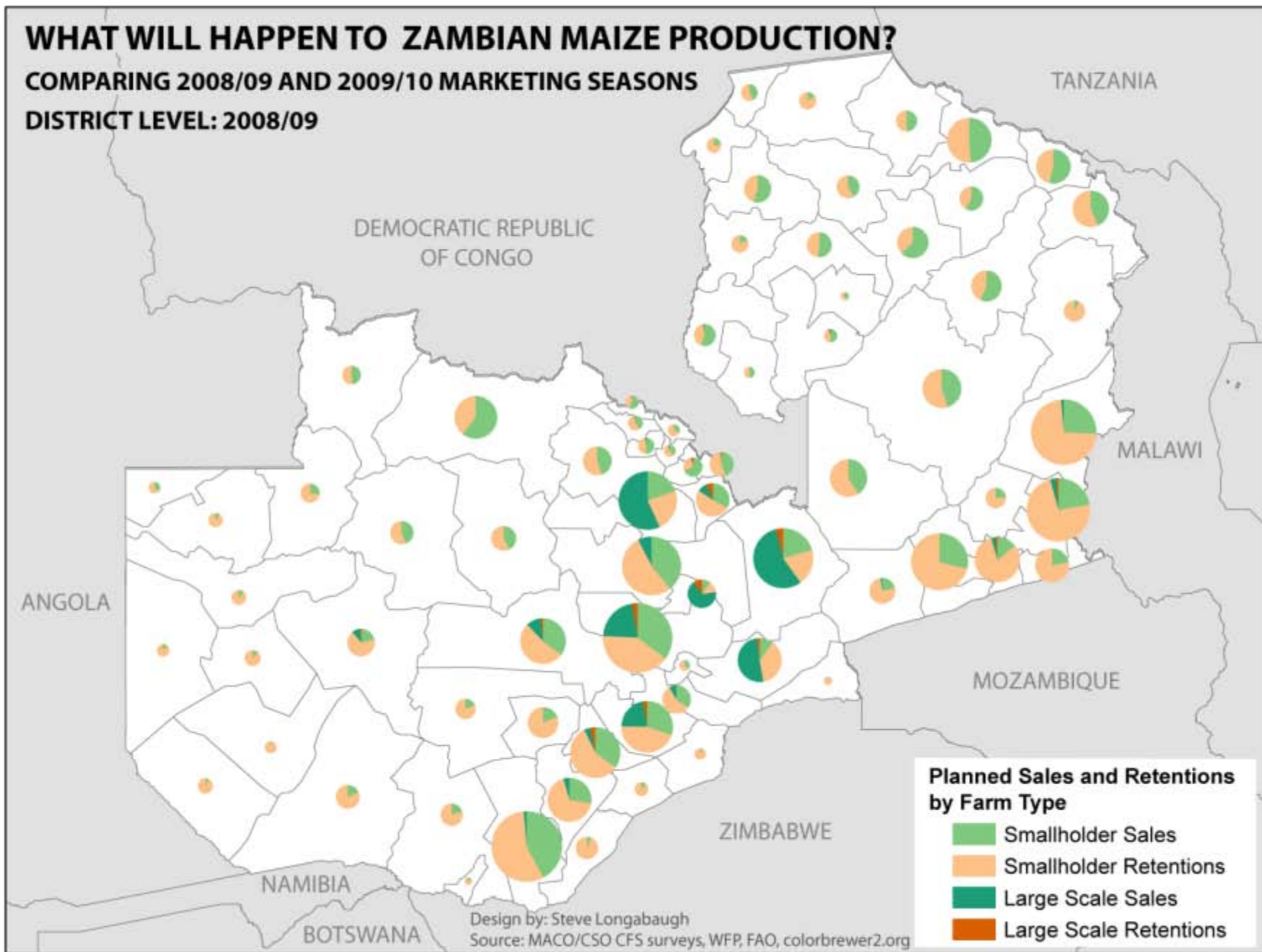
Expected maize production per S/M agricultural household in these 9 districts, 2008/09 and 2009/10



WHAT WILL HAPPEN TO ZAMBIAN MAIZE PRODUCTION?

COMPARING 2008/09 AND 2009/10 MARKETING SEASONS

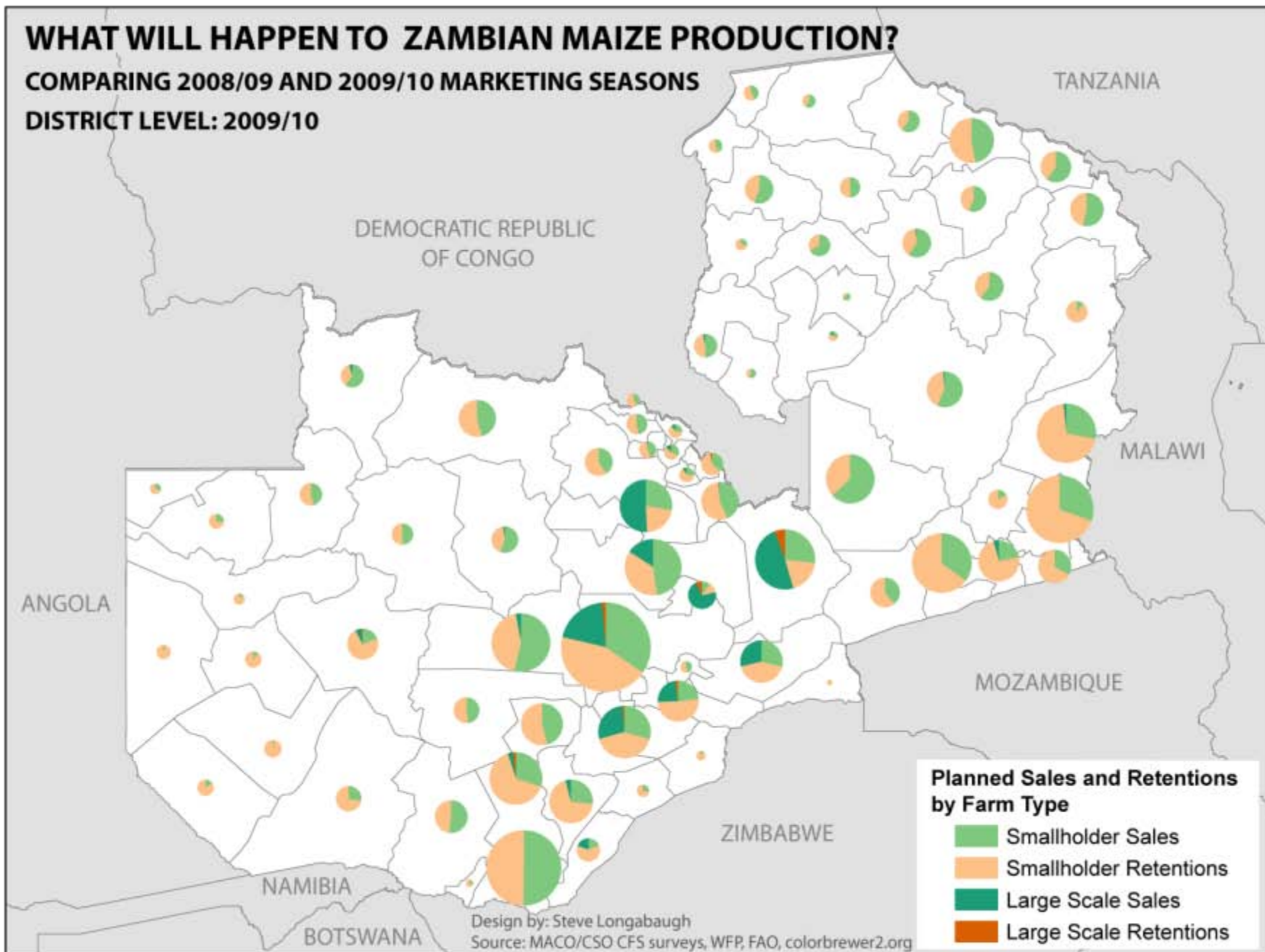
DISTRICT LEVEL: 2008/09



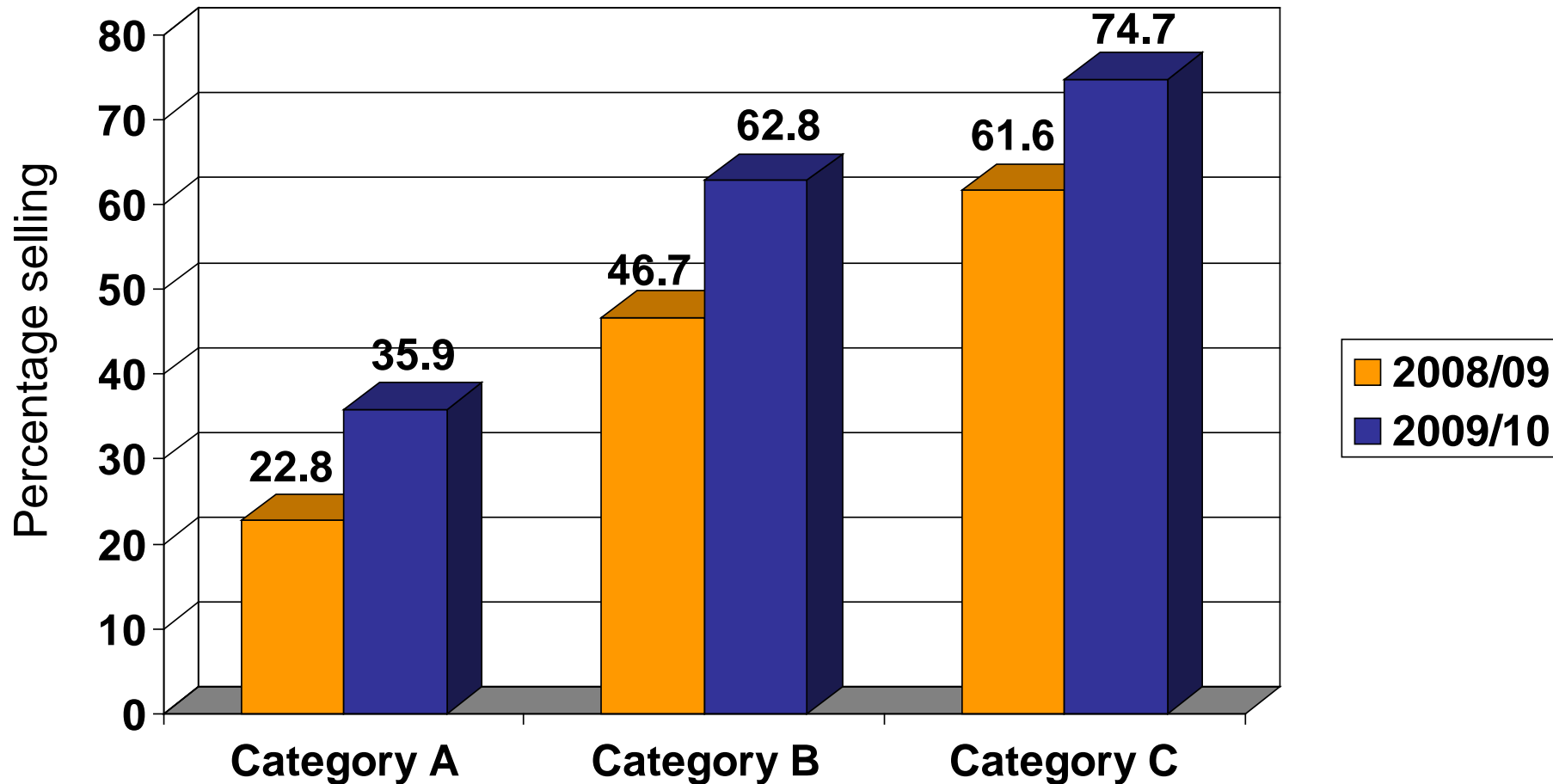
WHAT WILL HAPPEN TO ZAMBIAN MAIZE PRODUCTION?

COMPARING 2008/09 AND 2009/10 MARKETING SEASONS

DISTRICT LEVEL: 2009/10



% of smallholder maize growing households expected to sell maize, 2008/09 vs. 2009/10



Number of smallholder agricultural households acquiring fertilizer by source and year

Agricultural Season	FISP (Official target)	PAM	Commercial Purchases		Gift/Free	All Sources*
			Private Traders or retailers	Other		
2008/09	192,860 <i>(200,000)</i>	3,952	199,261	59,241	10,468	427,278
2009/10	292,662 <i>(534,190)</i>	10,844	277,076	73,859	19,173	585,940

*Some households acquired fertilizer through multiple channels so the sum of the individual source numbers slightly exceeds the “all sources” column

Amount of fertilizer acquisition by of smallholder agricultural households by source and year

Agricultural Season	FISP (Official target)	PAM	Commercial Purchases		Gift/Free	All Sources*
			Private Traders or retailers	Other		
2008/09	55,114 <i>(80,000)</i>	725	47,111	10,948	1,619	115,517
2009/10	69,100 <i>(106,836)</i>	1,762	78,781	15,247	2,311	167,200

Number of smallholder agricultural households acquiring fertilizer by source and category in 2008/09 vs. 2009/10

Agricultural Season	FISP	PAM	Commercial Purchases		Gift/Free	All Sources*
			Private Traders or retailers	Other		
All Households	192,860	3,952	199,261	59,241	10,468	427,278
	292,662	10,844	277,076	73,859	19,173	585,940
Category A	105,438	2,530	128,303	41,003	8,207	271,391
	166,178	6,655	165,320	43,633	14,193	364,209
Category B	66,106	1,100	52,239	13,407	2,042	119,973
	98,805	3,316	81,660	23,558	3,998	171,960
Category C	21,316	323	18,719	4,831	220	35,913
	27,679	872	30,097	6,670	982	49,771

*Some households acquired fertilizer through multiple channels so the sum of the individual source numbers slightly exceeds the “all sources” column

Amount of fertilizer acquisition by of S/M agricultural households by source and category in 2008/09 vs. **2009/10** (Metric Tonnes)

Agricultural Season	FISP	PAM	Commercial Purchases		Gift/Free	All Sources
			Private Traders or retailers	Other		
All Households	55,114	725	47,111	10,948	1,619	115,517
	69,100	1,762	78,781	15,247	2,311	167,200
Category A	23,243	305	17,711	5,227	784	47,269
	32,611	733	26,748	5,765	1,523	67,379
Category B	20,695	286	14,946	3,099	809	39,836
	26,103	733	27,334	6,301	541	61,012
Category C	11,176	134	14,454	2,621	26	28,412
	10,387	297	24,699	3,181	246	38,810

Amount of fertilizer acquisition by of S/M agricultural households by source and category in 2008/09 vs. **2009/10** (% of total)

Agricultural Season	FISP	PAM	Commercial Purchases		Gift/Free	All Sources
			Private Traders or retailers	Other		
All Households	47.7%	0.6%	40.8%	9.5%	1.4%	100.0%
	41.3%	1.1%	47.1%	9.1%	1.4%	100.0%
Category A	49.2%	0.6%	37.5%	11.1%	1.7%	100%
	48.4%	1.1%	39.7%	8.6%	2.3%	100%
Category B	52.0%	0.7%	37.5%	7.8%	2.0%	100%
	42.8%	1.2%	44.8%	10.3%	0.9%	100%
Category C	39.3%	0.5%	50.9%	9.2%	0.1%	100%
	26.8%	0.8%	63.6%	8.2%	0.6%	100%

Lessons Learned About the Ongoing CFS Quality Improvement Process

- CSO/MACO line budget needed for upkeep/upgrading of computers, software, virus protection & analysis skills
- Improved supervision in sample listing especially critical
- Use and reuse better quality enumerators in Provinces
- Getting data/insights back to Provinces for their use is critical for improving their incentives for quality data
- Important to retain experienced staff at Hq and Prov
- Use experienced data entry staff in Provinces - critical to cutting down the data verification/cleaning at Hq
- Demand for data quality upgrades come with data use