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Zambia Buy-in

SMALLHOLDER FARMERS' AND OTHER AGRICULTURAL SECTOR STAKEHOLDERS' PRIORITIES FOR GOVERNMENT SPENDING: EVIDENCE FROM ZAMBIA

By

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Robert Shupp, and Hambulo Ngoma



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Authors' Acknowledgment:

This work was made possible by the generous support of the American People provided to the Feed the Future Innovation Lab for Food Security Policy (FSP) through the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-13-00001 (Zambia Buy-In). This work was also supported by the US Department of Agriculture (USDA) National Institute of Food and Agriculture and Michigan AgBioResearch [project number MICL02501]. The contents are the sole responsibility of the authors and do not necessarily reflect the views of FSP, USAID, USDA, the United States Government, or Michigan AgBioResearch. **D**

This study is made possible by the generous support of the American people provided to the Feed the Future Innovation Lab for Food Security Policy (FSP) through the United States Agency for International Development (USAID) under Cooperative Agreement No. AID-OAA-L-13-00001 (Zambia Buy-In). The contents are the sole responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government.

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Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824, USA.

EXECUTIVE SUMMARY

Empirical evidence from around the world suggests that public good investments in agricultural research and development (R&D), extension, and rural roads often yield relatively higher returns, while expenditures on private goods like agricultural subsidies often yield relatively lower returns. In contrast, the Zambian government devotes large shares of its agricultural sector spending to subsidies, leaving little money to devote to other agricultural sector programs and investments. No previous studies have attempted to measure Zambian smallholder farmers' or other stakeholders' preferences for different types of public expenditures. This paper summarizes the key insights from data on these preferences collected between 2015 and 2019 through four different surveys (the 2015 and 2019 Rural Agricultural Livelihoods Surveys--RALS15 and RALS19; a 2017 E-Voucher Survey; and a 2019 stakeholder survey) and two different methodologies (a single open-ended question in RALS15 and RALS19; and the Best Worst Scaling [BWS] method in the E-Voucher survey and stakeholder survey).

Results from the open-ended question on nationally-representative surveys in 2015 and 2019 indicate that smallholder farmers' top priorities for additional government spending in general (not limited to the agricultural sector) are health care, roads and bridges, education, water and sanitation, and the Farmer Input Support Programme (FISP). Results from a smaller survey in 13 districts in 2017 using the BWS method that requires respondents to consider tradeoffs between different options and that focused on 10 specific agricultural sector policy options indicate that smallholder farmers would most like to see additional government spending be devoted to FISP or the Food Reserve Agency (FRA). In contrast, results from a similar BWS survey in 2019 with other agricultural sector stakeholders (representing research organizations, NGOs, government, private sector groups, and donors) indicate that these stakeholders view FRA and FISP as the lowest priorities for additional government spending. Instead, these stakeholders favor increased expenditures on public goods such as extension, rural infrastructure, and crop research and development, which have been shown to have high returns to agricultural growth and poverty reduction.

Overall, the survey results summarized in this paper suggest that, while there is some support among smallholder farmers for increased government spending on rural infrastructure and other agricultural sector public goods, major sensitization campaigns may be needed to raise awareness of the large likely benefits of these public goods investments. IAPRI's provincial-level outreach efforts are one potential mechanism for this. Such sensitization could help build the kind of broad base of public support needed to effectively encourage government to shift some resources away from FISP and FRA toward agricultural sector public goods. A Zambia-specific study on the returns to different types of government agricultural sector expenditures may help, as some groups with an interest in maintaining status quo government expenditure patterns may write off the evidence from other countries as irrelevant to Zambia.

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LIST OF ACRONYMS AND ABBREVIATIONS

BWS	Best Worst Scenario
CAPI	computer-assisted personal interviewing
E-voucher	Electronic voucher
FISP	Farmer Input Support Programme
FRA	Food Reserve Agency
Ha	hectare
IAPRI	Indaba Agricultural Policy Research Institute
Km	kilometer
MNL	multinomial logit
N	Number of observations
NGO	Non-Governmental Organization
NRM	Natural Resource Management
R&D	Research and Development
RALS	Rural Agricultural Livelihoods Survey
RPL	random parameters logit
SOP	share of preference

1. INTRODUCTION

Increasing agricultural growth and reducing rural poverty are critical for improving rural livelihoods in Zambia. Yet agricultural growth in the country has been erratic (Figure 1) and the rural poverty rate has declined only marginally since 2004.¹ Empirical evidence from around the world suggests that the pattern of government expenditures in the agricultural sector is of key importance for promoting agricultural growth and poverty reduction (e.g., Economist Intelligence Unit, 2008; Fan et al., 2008; World Bank, 2008; Goyal and Nash, 2017; among others). For example, public good investments in agricultural research and development (R&D), extension, and rural roads often yield relatively higher returns, while expenditures on private goods like agricultural subsidies often yield relatively lower returns (Table 1).² In contrast, the Zambian government devotes the lion's share of its agricultural sector spending to such subsidies (e.g., agricultural input subsidies through the Farmer Input Support Programme (FISP) and maize price subsidies through the Food Reserve Agency (FRA)), leaving little money to devote to other agricultural sector programs and investments (Figure 2). One potential explanation for this is that although the economic returns to things like agricultural R&D and rural infrastructure are likely to be high, the benefits are diffuse and often take many years to materialize. On the other hand, political economy considerations may drive policymakers to favor programs like FISP and FRA, which are more tangible and have effects that are realized more rapidly. The conventional wisdom that Zambian voters favor these types of programs may also play a role, despite there being no empirical evidence to suggest that these programs win votes (Mason et al., 2017). It is thus an open question whether Zambians, particularly smallholder farmers who make up the majority of the rural population, really do prefer programs like FISP and FRA over other types of government expenditures in the agricultural sector.

Key findings

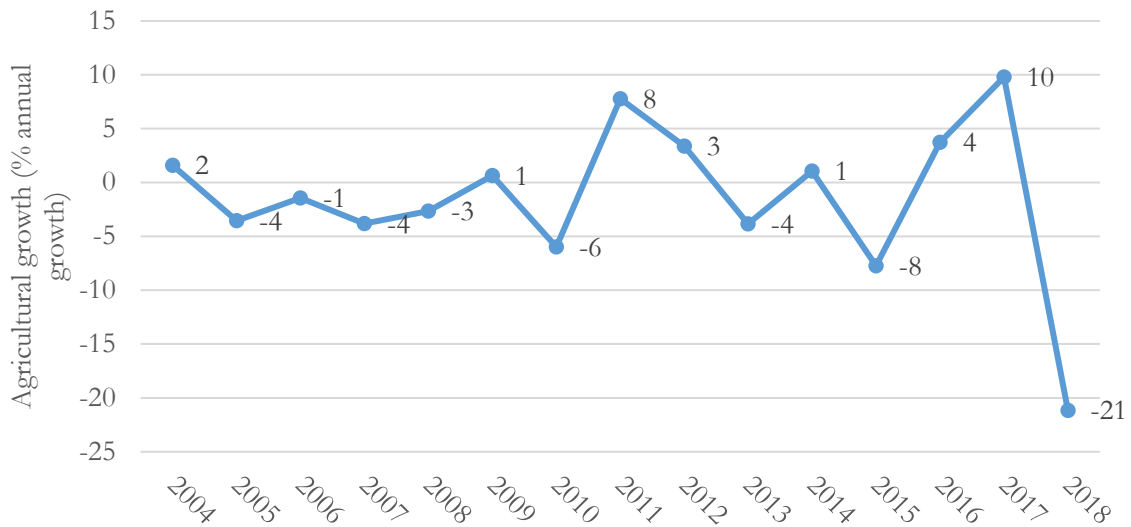
- Results from an open-ended question on nationally-representative surveys in 2015 and 2019 indicate that smallholder farmers' top priorities for additional government spending in general (not limited to the agricultural sector) are health care, roads and bridges, education, water and sanitation, and the Farmer Input Support Programme (FISP).
- Results from a smaller survey in 13 districts in 2017 using a method ("best-worst scaling" (BWS)) that requires respondents to consider tradeoffs between different options and that focused on 10 specific agricultural sector policy options indicate that smallholder farmers would most like to see additional government spending be devoted to FISP or the Food Reserve Agency (FRA).
- In contrast, results from a similar BWS survey in 2019 with other agricultural sector stakeholders (representing research organizations, NGOs, government, private sector groups, and donors) indicate that these stakeholders view FRA and FISP as the lowest priorities for additional government spending. Instead, these stakeholders favor increased expenditures on public goods such as extension, rural infrastructure, and crop research and development, which have been shown to have high returns to agricultural growth and poverty reduction.

¹ The rural poverty rate (headcount ratio) at the national poverty line was 78.0% in 2004, 80.0% in 2006, 77.9% in 2010, and 76.6% in 2015, the most recent year for which data are available (Zambia Central Statistical Office, various years).

² The figures in Table 1 are based on economic analyses for six Asian countries during their agricultural growth booms. To our knowledge, there are no comparable figures for all expenditure types in Table 1 for any African countries. However, results from a study in Uganda that considered three types of rural investments found the returns to both agricultural growth and poverty reduction to be highest for: (1) agricultural R&D and extension (combined), followed by (2) feeder roads, and then (3) rural education (Fan & Zhang, 2008).

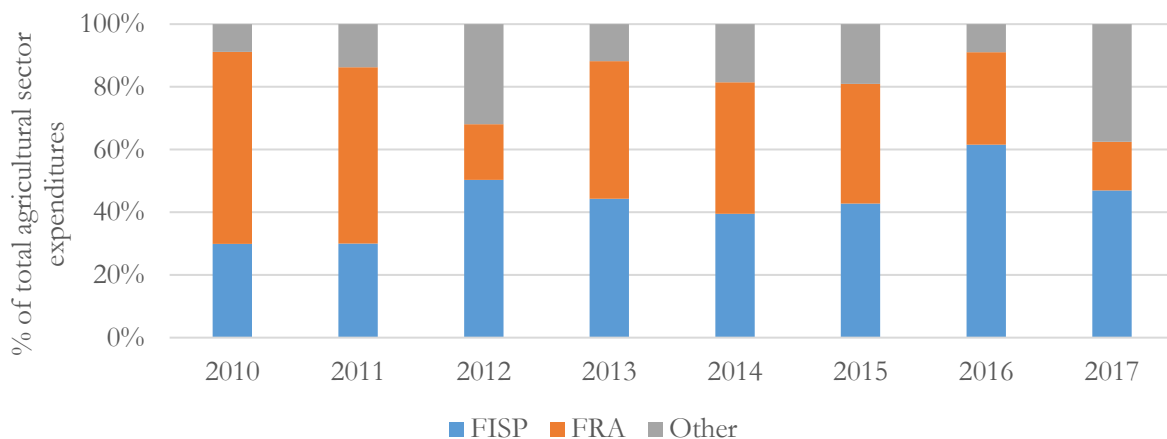
To our knowledge, no previous studies have attempted to measure Zambian smallholder farmers' or other stakeholders' preferences for different types of public expenditures. This FSP Research Paper summarizes the key insights from data on these preferences collected between 2015 and 2019 through four different surveys and two different methodologies.

Figure 1. Annual agricultural growth in Zambia, 2004-2018



Note: Figure depicts annual percentage growth rates in agriculture, forestry, and fishing value-added. Annual growth is calculated as value-added in a given year minus value-added in the previous year, all divided by value-added in the previous year. Source: World Bank (2019).

Figure 2. Percentage of total agricultural sector public expenditures devoted to FISP and FRA versus other items, 2010-2017



Source: Zambia Ministry of Finance (various years).

Table 1. Returns to poverty reduction and agricultural output growth for different types of public expenditure – data from six Asian countries during their agricultural growth booms

PANEL A. RETURNS TO POVERTY REDUCTION							
Expenditure type	Poverty reduction in people per US\$ million spent (rank based on relative returns in parentheses) ^a						Median rank
	India (1982-1994)	China (1978-1990)	Indonesia (1976-1993)	South Korea (1970-1979)	Taiwan (1950-1960)	Vietnam (1990-1999)	
Ag./NRM research	320 (3)	344 (6)	1,034 (1)	161 (7)	833 (1)	10,630 (1)	2.00
Ag. credit/insurance subsidies	137 (7)	2,202 (1)	643 (2)	387 (5)	417 (2.5)	2,195 (3)	2.75
Ag./NRM extension	181 (5)	691 (3)	N/A (-)	710 (3)	417 (2.5)	9,243 (2)	3.00
Rural roads	461 (1)	690 (4)	261 (3)	472 (4)	282 (4)	1,508 (5)	4.00
Irrigation	184 (4)	918 (2)	119 (4)	726 (2)	213 (5.5)	173 (7)	4.00
Electricity/health/education/telecoms	376 (2)	459 (5)	104 (5)	914 (1)	142 (7)	1,675 (4)	4.50
Ag. input/machinery subsidies	171 (6)	69 (7)	98 (6)	383 (6)	213 (5.5)	193 (6)	6.00
PANEL B. RETURNS TO AGRICULTURAL OUTPUT GROWTH							
Expenditure type	US\$ per US\$ spent (rank based on relative returns in parentheses)						Median rank
	India (1982-1994)	China (1978-1990)	Indonesia (1976-1993)	South Korea (1970-1979)	Taiwan (1950-1960)	Vietnam (1990-1999)	
Ag./NRM research	67.2 (2)	8.0 (3)	81.7 (1)	16.9 (4)	12.1 (1)	406.7 (1)	1.5
Rural roads	16.6 (7)	8.4 (2)	16.7 (3)	18.0 (3)	8.2 (2)	14.1 (3)	3.0
Irrigation	35.0 (3)	10.0 (1)	8.1 (5)	23.4 (2)	3.1 (6)	12.7 (4)	3.5
Ag./NRM extension	21.5 (6)	5.0 (4)	N/A (-)	24.5 (1)	4.8 (4)	92.4 (2)	4.0
Ag. input/machinery subsidies	26.6 (5)	2.3 (5)	8.2 (4)	14.6 (6)	7.4 (3)	8.5 (5)	5.0
Electricity/health/education/telecoms	82.0 (1)	1.7 (7)	4.5 (6)	15.6 (5)	4.1 (5)	2.6 (6)	5.5
Ag. credit/insurance subsidies	27.4 (4)	2.0 (6)	42.1 (2)	8.4 (7)	2.4 (7)	1.2 (7)	6.5

Notes: NRM = natural resource management. Expenditure types sorted by median rank in each panel. Numbers reported are based on data from six Asian countries during their agricultural growth booms. ^aPoverty reduction is total (rural and urban) for all countries except for Vietnam, which is rural poverty reduction only. Source: Calculated from expenditure and resultant agricultural output growth and poverty reduction values reported in Economist Intelligence Unit (2008). Note that the rankings in the table are based on the relative returns results in the table, which are based on economic analyses, not opinion surveys of farmers or other agricultural sector stakeholders.

2. DATA

The findings reported in this FSP Research Paper are derived from the following data sources:

- A question on the 2015 and 2019 Rural Agricultural Livelihoods Surveys (RALS15 and RALS19). These surveys were implemented by the Indaba Agricultural Policy Research Institute (IAPRI) in conjunction with the Central Statistical Office, the Ministry of Agriculture, the Ministry of Fisheries and Livestock in June and July 2015 and 2019. These surveys are nationally- and provincially-representative of smallholder farm households, and have sample sizes of 7,933 and 7,241 households, respectively.³ The RALS is a longitudinal (panel) household survey, meaning that the same households are followed over time; however, the main respondent for a given household might have different between RALS15 and RALS19.

³ These data are also representative at the district-level for Eastern Province.

- A module on the E-Voucher-Based FISP Follow-Up Survey, implemented by IAPRI in June and July 2017 (henceforth, the “2017 E-Voucher Survey”).⁴ A total of 710 households in 13 districts were interviewed for this survey. The 13 districts were Chibombo, Kabwe, Kapiri Mposhi, Mkushi, Chisamba, Sinda, Chongwe, Rufunsa, Choma, Mazabuka, Monze, Namwala, and Chikankata.
- A survey of other Zambian agricultural sector stakeholders representing research organizations, government, NGOs, private sector organizations, and donor agencies (henceforth, the “2019 Stakeholder Survey”), implemented by IAPRI from January-April 2019. A total of 62 stakeholders completed the survey module on policy preferences. Figure 3 shows the composition of these respondents by organization type.

The 2019 Stakeholder Survey was implemented via an online survey that respondents completed on their own on a laptop, tablet, or mobile phone. The other three surveys were conducted via in-person interviews using the computer-assisted personal interviewing (CAPI) method.

Figure 3. Composition of the 2019 Stakeholder Survey sample by organization type

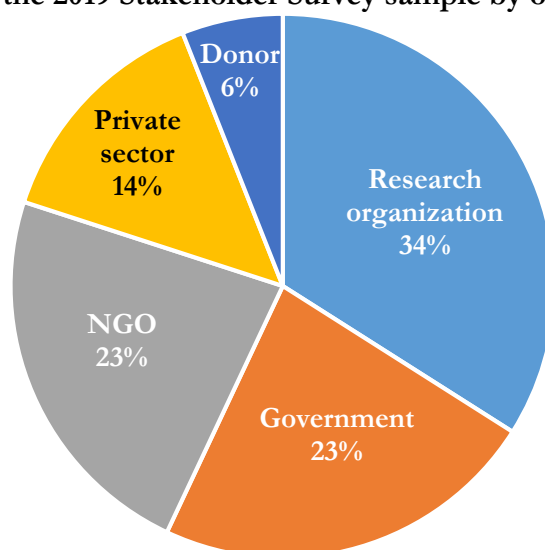


Table 2 shows the socioeconomic characteristics for the RALS15, RALS19, and 2017 E-Voucher Survey samples. There are some differences between the 2017 E-Voucher Survey sample and the RALS samples. On average, the former is somewhat more educated and somewhat more likely to be male, married, and the household head. On average, the E-Voucher Survey respondents also came from slightly larger households, cultivated somewhat more land, grew more maize, had more livestock, were less likely to produce fruits or vegetables, and were located closer to a fertilizer retailer than RALS respondents. The largest difference, however, is in the percentage of respondents that were FISP beneficiaries: 73% of 2017 E-Voucher Survey respondents were FISP beneficiaries compared to 36% of RALS respondents. Given this difference, in the analysis of the 2017 E-Voucher Survey described below, we check for differences in policy preferences between FISP beneficiaries and non-beneficiaries but conclude that these two groups’ preferences are similar.

⁴ This survey was for an impact evaluation of the e-FISP but included a module on respondents’ agricultural sector policy preferences, on which we report here.

Table 2. Descriptive statistics for RALS15, RALS19, and the 2017 E-Voucher Survey

Variable	Mean values (medians for distances)		
	2015 RALS (N=7,933)	2019 RALS (N=7,241)	2017 E-Voucher Survey (N=710)
<i>Respondents' individual characteristics</i>			
Age (years)	45.2	48.4	48.1
=1 if female	0.471	0.490	0.345
=1 if household head	0.731	0.733	0.855
=1 if married	0.688	0.706	0.770
Highest level of education completed:			
=1 if none	0.141	0.141	0.065
=1 if lower primary (grades 1-4)	0.237	0.244	0.161
=1 if upper primary (grades 5-7)	0.367	0.369	0.349
=1 if secondary (grades 8-12)	0.226	0.224	0.386
=1 if post-secondary	0.027	0.023	0.039
<i>Respondents' household characteristics</i>			
Household size (number of members)	5.9	5.1	6.3
=1 if grew field crops	0.974	0.971	0.973
Field crops area cultivated (ha)	2.04	2.00	2.55
=1 if small-scale farm household (cultivate < 2 ha)	0.592	0.624	0.535
=1 if grew maize	0.870	0.871	0.949
Maize area cultivated (ha)	1.06	1.07	1.86
=1 if produced fruits or vegetables	0.669	0.787	0.452
=1 if raised or owned livestock, poultry, or fish	0.786	0.855	0.841
Tropical livestock units owned (cattle, pigs, goats, sheep)	1.27	1.50	4.03
=1 if owns a water pump, treadle pump, or other irrigation equipment	0.028	0.053	0.055
=1 if FISP beneficiary (acquired fertilizer through FISP for RALS)	0.357	0.359	0.728
=1 if sold maize to the FRA	0.211	0.102	0.072
=1 if obtained a loan to support agricultural production	0.149	0.165	0.182
Median km from the homestead to the nearest:			
Fertilizer retailer	22	20	12
Agrodealer	17	15	13
FRA buying point	5	6	5
Tarmac/tarred road	15	15	8
Feeder road	0	0	0
Agricultural camp or block office (gov't extension office)	7	6	5

3. METHODS

Two different methods were used to elicit respondents' priorities for government spending.

- **Method 1 – A single open-ended question:** On RALS15 and RALS19, respondents were asked the following question, “*If government could increase its spending, what do you think should be the top priority and second most important priority for additional investment/ spending?*” This was stated as an open-ended question. Note that this question did not specifically ask respondents to think about priorities in the agricultural sector per se; however, the sample was composed of smallholder farmers. In the Results section, we report the frequency with which various responses were listed as the top priority, the second priority, and either the top or second priority.

- Method 2 – Best-Worst Scaling (BWS):** For the 2017 E-Voucher Survey and the 2019 Stakeholder Survey, the BWS method was applied and the focus was on government spending on a pre-determined list of potential agricultural sector investments and programs (henceforth, “policy options”). Ten policy options were included in the 2017 E-Voucher Survey and seven were included in the 2019 Stakeholder Survey. See Table 3 for a list of these policy options.⁵ The BWS method entailed respondents completing a series of choice sets on which they were asked to select the best (most desirable) and worst (least desirable) use of funds if government were to *increase* its agricultural sector spending by K500 million (roughly 10% of the Ministry of Agriculture Budget in the survey years). In the 2017 E-Voucher Survey (2019 Stakeholder Survey), respondents each completed five (seven) such choice sets, each including a different subset of four policy options from the 10 (seven) total policy options. Respondents also completed the same number of choice sets for a scenario in which government had to *cut* its agricultural sector spending by K500 million. See Figure 4 for illustrative choice sets in the increase spending and cut budget scenarios. (See the Technical Appendix for a complete list of the choice sets on each of the surveys and additional details on the respective BWS designs.)

Statistical analysis of the BWS data via multinomial logit or random parameters logit modeling yields ordinal and cardinal rankings of the policy options in each scenario. The directly interpretable result is the so-called “share of preference” (SOP) for each policy option. This gives the probability that a given policy option is chosen as best or most desirable from the full list of policy options. For example, a share of preference of 20% for the “Roads & bridges” policy option would indicate that there is a 20% probability that this policy option is chosen as the most preferred. SOPs sum to 100% when added together across the full set of policy options.

BWS has a number of advantages and has been used in peer-reviewed publications on US dairy farmers’ policy preferences (Wolf & Tensor, 2013) and US consumers’ agricultural and food policy preferences (Caputo & Lusk, 2019), in addition to many other applications. Two of the key advantages of the BWS method are that: (i) it requires respondents to consider tradeoffs among policy options (e.g., money spent on one option cannot be spent on other options); and (ii) choosing the extremes (“best” and “worst”) from several short lists of options is much less cognitively taxing than ranking a long list of options all at once (Marley & Louviere, 2005; Lusk & Briggeman, 2009). Furthermore, because BWS data enable one to calculate cardinal rankings, not just ordinal ones, the results indicate by *how much* a given policy option is favored over another. (Ordinal rankings only indicate that one option is preferred to another but not by how much.)

⁵ Note that the 2019 Stakeholder Survey combined the two FISP and the two FRA options from the 2017 E-Voucher Survey, slightly reworded the extension policy option, added a policy option related to regulatory capacity, and dropped the policy options on livestock/fish R&D and irrigation. These two policy options were dropped due to their very low rankings in the 2017 E-Voucher Survey-based BWS results. Also note that we did not use the term “R&D” in the policy option descriptions presented to respondents but instead used terminology intended to be more readily understandable, particularly for smallholder farmer respondents who might be unfamiliar with what R&D entails.

Table 3. Policy options in the 2017 E-Voucher Survey and the 2019 Stakeholder Survey (increase spending scenario)^a

2017 E-Voucher Survey		2019 Stakeholder Survey	
Full description	Short name	Full description	Short name
Increase the number of FISP beneficiaries	FISP beneficiaries	Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	FISP
[Traditional FISP districts] Increase the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Increase the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	FISP quantity/value		
Increase the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”).	FRA price	Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers	FRA
Increase the total amount of maize that the FRA buys from smallholder farmers.	FRA quantity		
Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones).	Roads & bridges	Same as 2017 E-Voucher Survey	Roads & bridges
Increase the number of agricultural extension agents available to smallholder farmers.	Extension	Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	Extension
Develop better crop varieties and crop management practices for smallholder farmers.	Crop R&D	Same as 2017 E-Voucher Survey	Crop R&D
Develop better livestock and fish breeds and management practices for smallholder farmers.	Livestock/fish R&D		
Improve access to quality irrigation for smallholder farmers.	Irrigation		
Improve access to affordable credit/loans for smallholder farmers.	Credit	Same as 2017 E-Voucher Survey	Credit
		Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	Regulatory capacity

Notes: The full policy option descriptions were read to respondents. The “short names” listed in the table are shorthand labels that we will use in the remainder of the paper. At the time of the 2017 E-Voucher Survey, the e-FISP had been piloted in 39 districts. Of the 13 districts covered in the survey, three were traditional FISP districts (Namwala, Sinda, and Mkushi) and the other 10 were e-FISP pilot districts. ^aIn the decrease spending scenario, the policy options were phrased in terms of reducing the number of FISP beneficiaries or FISP quantity/value, reducing the FRA maize price or total quantity of maize purchased, or reducing spending on the other policy options in the table above. See the Technical Appendix for the exact wording.

Figure 4. Example choice set for the increase spending vs. cut budget scenarios

Increase spending scenario: For this set of questions, we would like you to consider a situation where the Zambian government has 500 million Kwacha in additional funds to spend on the agricultural sector. I will read you lists of four different ways the government could use the money. For each list, we would like to know which option you think is the best (most desirable) use of the money, and which is the worst (least desirable) use of the money.

Most Desirable	Government should use the additional money for the agricultural sector to ...	Least Desirable
<input type="radio"/>	Increase the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	[Traditional FISP districts] Increase the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Increase the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Increase the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Develop better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>

Cut budget scenario: For this set of questions, we would like you to consider a situation where the Zambian government must cut 500 million Kwacha from its agricultural sector budget. I will read you lists of four different ways the government could cut the budget. For each list, we would like to know which option you think is the best (most desirable) way to cut the budget, and which is the worst (least desirable) way to cut the budget.

Most Desirable	To cut its agricultural sector budget, government should ...	Least Desirable
<input type="radio"/>	Reduce the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	[Traditional FISP districts] Reduce the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Reduce the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Reduce the price at which the FRA buys maize from farmers (that is, reduce the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Reduce spending on developing better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>

4. MAIN FINDINGS

RALS15 and RALS19 open-ended questions

Based on the RALS15 and RALS19 open-ended questions on respondents' priorities for additional government spending (not limited to the agricultural sector), the five most frequently cited items were: health care, roads and bridges, education, water and sanitation, and input subsidies/FISP (Table 4). Across the two surveys and columns in Table 4 (top priority, second priority, and either top or second priority), these five items accounted for the vast majority (67-82%) of the responses (Table 4, last row). Although the same items were in the top five in both surveys, there were some slight shifts in their relative importance within the top five between survey rounds. For example, whereas the rankings based on the "top" column in RALS15 were (1) health care, (2) roads and bridges, (3) water and sanitation, (4) education, and then (5) FISP, in RALS19, roads and bridges was the most frequently cited, followed by water and sanitation, and health care; education and FISP remained at ranks 4 and 5. Note that of the top five items cited by RALS respondents, only (rural) roads and bridges, and FISP were included in the BWS modules on the 2017 E-Voucher Survey and 2019 Stakeholder Survey because those surveys focused specifically on agricultural sector programs and investments.

Table 4. Smallholder farmers' government spending priorities based on RALS15 & RALS19 - nationwide

Policy option	RALS15			RALS19		
	Percentage of respondents nationwide citing this policy option as their ___ priority					
	Top	2 nd	Top or 2 nd	Top	2 nd	Top or 2 nd
Health care	19.8	22.5	21.1	15.1	19.4	17.2
Roads and bridges*	19.1	14.3	16.7	20.7	13.7	17.2
Water and sanitation	15.3	12.1	13.7	17.4	14.3	15.9
Education	14.8	14.0	14.4	12.1	11.5	11.8
Input subsidies/FISP*	13.1	12.1	12.6	11.5	8.2	9.8
Other agricultural development (crops, livestock, fisheries)	4.9	4.8	4.8	7.0	7.2	7.1
Rural electrification	4.2	6.4	5.3	3.7	8.0	5.8
Maize marketing/FRA activities*	1.8	2.7	2.3	1.4	2.8	2.1
Improved agricultural extension and training*	1.8	2.4	2.1	1.8	2.6	2.2
Social cash transfers	1.5	1.9	1.7	2.2	3.2	2.7
Security, like the police and military	0.8	1.8	1.3	0.7	1.1	0.9
Develop improved crop varieties or mgmt. practices*	0.7	1.0	0.9	0.8	1.2	1.0
Other social protection programs	0.7	1.6	1.1	1.1	2.5	1.8
Irrigation*	0.7	0.6	0.6	1.5	2.0	1.8
Energy supply	0.4	1.0	0.7	0.7	0.9	0.8
Mobile phone services	0.2	0.4	0.3	0.6	0.4	0.5
Hammer milling services	0.2	0.4	0.3	1.4	0.4	0.9
Other ^a	0.0	0.1	0.0	0.4	0.7	0.5
Total	100	100	100	100	100	100
Top 5 share ^b	82.2	74.9	78.5	76.8	67.1	72.0

Notes: Policy options listed in order of percentage of RALS15 respondents citing the policy option as their top spending priority. ^a Other refers to policy options cited by 0.3% or less of respondents in all cases (banking services, loans/empowerment funds, establishing/facilitating markets, establishing/facilitating businesses, and local government infrastructure development). ^b Top 5 refers to the first five policy options listed in the table. * Indicates policy options for which a similar policy option was included in the BWS modules on the 2017 E-Voucher Survey and/or 2019 Stakeholder Survey.

Recall that the smallholder farmer BWS was done in 13 districts. (See the Methods section for the list of districts.) For comparability's sake, Table 5 shows the RALS-based open-ended question results for respondents in these 13 districts only. The top five most highly ranked top priority policy options are the same as in the nationwide results in Table 4 but the ordering of these top five is slightly different when we focus on respondents in the 13 E-Voucher Survey districts. Between the two agricultural sector-related options in the top five (FISP, and roads and bridges), among respondents in the 13 districts FISP was slightly more frequently cited as the top priority in the 2015 RALS (16%) than was roads and bridges (13%); however, in the 2019 RALS, these respondents were much more likely to cite roads and bridges (18%) than FISP (10%) as their top priority.

Table 5. Smallholder farmers' government spending priorities based on RALS15 & RALS19 – in the 13 districts included in the 2017 E-Voucher Survey

Policy option	RALS15			RALS19		
	Percentage of respondents in 13 districts citing this policy option as their ___ priority					
	Top	2 nd	Top or 2 nd	Top	2 nd	Top or 2 nd
Water and sanitation	21.7	14.8	18.2	23.5	16.7	20.1
Health care	20.9	21.0	20.9	11.2	15.4	13.3
Input subsidies/FISP*	15.6	12.9	14.3	9.6	7.4	8.5
Roads and bridges*	13.0	13.6	13.3	18.0	12.8	15.4
Education	12.3	13.8	13.1	10.1	11.0	10.5
Rural electrification	5.9	7.4	6.6	4.3	6.2	5.3
Other agricultural development (crops, livestock, fisheries)	4.1	5.9	5.0	7.1	10.8	9.0
Maize marketing/FRA activities*	1.1	1.1	1.1	1.0	3.1	2.0
Irrigation*	1.0	0.7	0.9	4.2	4.2	4.2
Improved agricultural extension and training*	1.0	1.5	1.2	1.9	3.7	2.8
Other social protection programs	0.8	1.7	1.3	2.5	2.4	2.5
Security, like the police and military	0.8	1.1	0.9	0.7	0.7	0.7
Social cash transfers	0.6	2.1	1.4	2.3	1.4	1.8
Energy supply	0.5	0.8	0.6	0.6	1.1	0.8
Develop improved crop varieties or mgmt. practices*	0.5	1.3	0.9	1.1	2.3	1.7
Mobile phone services	0.2	0.0	0.1	0.8	0.0	0.4
Hammer milling services	0.0	0.3	0.2	1.0	0.2	0.6
Other ^a	0.0	0.1	0.0	0.1	0.7	0.4
Total	100	100	100	100	100	100
Top 5 share ^b	83.5	76.1	79.8	72.4	63.3	67.9

Notes: N=1,390 for RALS15 and 1,245 for RALS19. Policy options listed in order of percentage of RALS15 respondents citing the policy option as their top spending priority. ^a Other refers to policy options cited by 0.3% or less of respondents in all cases (banking services, loans/empowerment funds, establishing/facilitating markets, establishing/facilitating businesses, and local government infrastructure development). ^b Top 5 refers to the first five policy options listed in the table. * Indicates policy options for which a similar policy option was included in the BWS modules on the 2017 E-Voucher Survey and/or 2019 Stakeholder Survey.

Smallholder farmer BWS results

Based on the responses from 710 smallholder farmers in 13 districts via the 2017 E-Voucher Survey, the BWS results suggest that, of the 10 policy options included, smallholder farmers would most like to see an **increase in agricultural sector spending** be used on FISP (either to increase the subsidy amount or the number of beneficiaries) (Figure 5). These policy options had SOPs of 23% and 18%, respectively. Recall that the SOP indicates the likelihood that a given policy option is chosen as

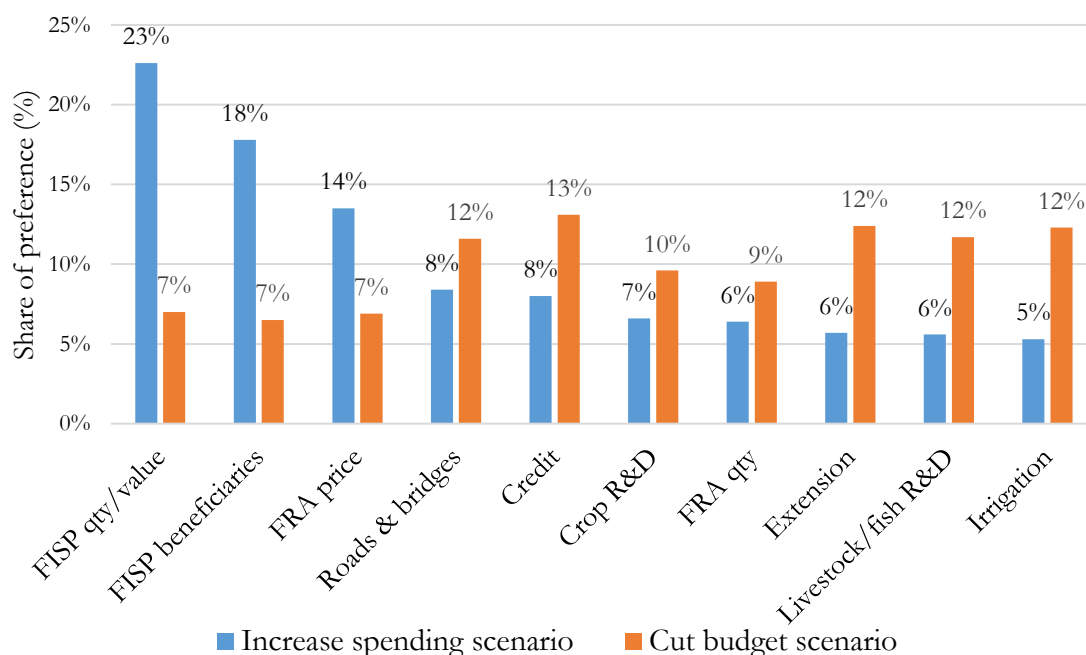
“best”. Ranking third in smallholders’ preferences for the increase spending scenario was to raise the FRA maize producer price. Roads and bridges, credit, and crop R&D were ranked fourth, fifth, and sixth. At the bottom of the rankings were increasing the number of extension agents and increasing spending on livestock/fish R&D or irrigation. Note the large decline between the SOPs for the top three spending priorities (SOPs of 14%-23%) relative to the bottom seven (SOPs of 5-8%). This suggests relatively strong preferences for the top three spending priorities (FISP quantity/value, FISP beneficiaries, and FRA price) but relatively little difference in preferences among the bottom seven policy options. Keep in mind that these results are based on the opinions of smallholder farmers in 13 districts, whereas the results in Table 1 are based on economic analyses. Also recall that the BWS focused on the 10 specific policy options in the left two columns of Table 3 (not all of the items listed by RALS respondents in Tables 4 and 5) and required respondents to make tradeoffs among them, picking the “best” and “worst” in five different sub-sets of four policy options each. Then rankings were derived from these results. This approach is very different from the RALS questions, which were open-ended and simply asked respondents to state their top and second priorities for increased government spending (in any sector). Nonetheless, there is some similarity between the RALS findings and the BWS findings in that FISP was highly ranked in both. Roads and bridges were fairly highly ranked in both methods as well (albeit with weaker support in the BWS results than in the RALS open-ended questions).

When smallholder farmers in the 13 districts were asked where to **reduce government spending** in the cut budget scenario BWS, the credit policy option was ranked first, followed by extension, irrigation, livestock/fish R&D, and roads and bridges (SOPs of 12-13%). In sixth and seventh place, respectively, were cutting the budget by reducing spending on crop R&D and the quantity of maize purchased by the FRA (SOPs of 9-10%). The smallholder farmers interviewed least wanted the budget cuts to come via shrinking spending on FISP or reducing the FRA price (SOPs of 7%). Overall, the spread of SOPs was considerably less in the cut budget scenario than in the increase spending scenario, indicating that smallholders’ preferences were more varied and weaker in the cut budget scenario.

We also analyzed the 2017 E-Voucher Survey BWS responses separately for FISP beneficiaries versus non-beneficiaries, in part because a considerably higher percentage of respondents to this survey were FISP beneficiaries compared to the percentage in the RALS sample. However, FISP beneficiaries’ and non-beneficiaries’ policy preferences were very similar and paralleled the findings in Figure 5. The only substantive difference was that FISP non-beneficiaries ranked expanding FISP to include more farmers more highly than increasing the quantity or value of the FISP subsidy – presumably so that they might have an opportunity to participate in the program.⁶

⁶ See the Technical Appendix for details.

Figure 5. Smallholder farmers' policy preferences per the 2017 E-Voucher Survey



Note: The reported shares of preference are based on correlated random parameters logit model results. See the Technical Appendix for details.

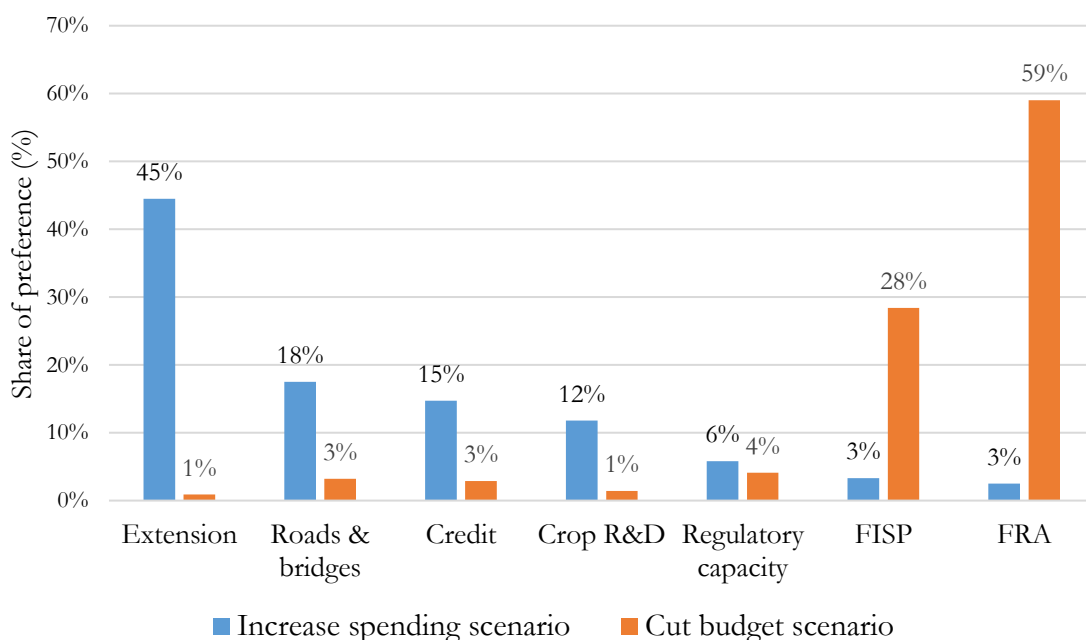
That the smallholders surveyed in the 2017 E-Voucher survey favored the FISP- and FRA-related policy options relative to the others is, perhaps, not surprising, given that many of the other policy options are public goods with impacts that are only likely to be felt after several years and that may not directly affect the individuals surveyed (e.g., the R&D options). Moreover, government extension is currently very weak, farmer-to-extension agent ratios are high, and extension agents are frequently without the training and resources needed to adequately support the farmers they are charged to serve. Farmers thus might not view increasing the number of extension agents in-and-of-itself as a good use of additional government agricultural sector funds, should they become available. While the returns to agricultural growth and poverty reduction of additional expenditures on FISP and FRA are likely to be low, and the returns to the other policy options are likely to be much higher, smallholder farmers are unlikely to be aware of this. Moreover, FISP and FRA are familiar to smallholder farmers, as these programs have been the focus of agricultural sector government expenditures since the early 2000s.

Stakeholder BWS results

In contrast to the BWS results from smallholder farmers in 13 districts, the results from the BWS implemented with other agricultural sector stakeholders via the 2019 Stakeholder Survey indicate that these stakeholders' policy preferences are significantly more in line with the empirical evidence on the relative returns to agricultural growth and poverty reduction of different types of agricultural sector expenditures. Per Figure 6, among the stakeholders interviewed, extension was strongly viewed as the top priority for additional government spending. Investments in roads and bridges, improving access to credit, and crop R&D ranked second, third, and fourth, respectively. In contrast, FRA and FISP were strongly favored as the best places to cut agricultural sector spending if need be, and only 3% of respondents favored additional spending on each of these programs.

Recall that the 2019 Stakeholder Survey was administered to individuals that work for government and donor agencies, NGOs, and private sector and research organizations, all with a focus on the agricultural sector. These individuals are much more likely to be aware of: (i) the evidence from other countries on the relative returns to different types of agricultural sector expenditures; and (ii) the Zambian government’s budget allocations to and expenditures on FISP and FRA relative to other potential agricultural sector investments and programs. Both of these are things that IAPRI has emphasized repeatedly in its research and outreach efforts.

Figure 6. Agricultural sector stakeholders’ policy preferences per the 2019 Stakeholder Survey



Note: The reported shares of preference are based on correlated random parameters logit model results. See the Technical Appendix for details.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Overall, the survey results summarized in this paper suggest that, when asked an open-ended question and not forced to consider tradeoffs, smallholder farmers’ highest priorities for additional government spending are health care, roads and bridges, education, water and sanitation, and FISP (Tables 4 and 5). However, when limited to the 10 agricultural sector-related policy options included in the smallholder farmer BWS and forced to make tradeoffs, FISP- and FRA price-related policy options rise to the top, followed distantly by roads and bridges (Figure 5). In contrast, a diverse cross-section of other agricultural sector stakeholders (representing research organizations, NGOs, government, private sector groups, and donors) view FRA and FISP as the lowest priorities for additional government spending and the two items that would be best to cut should agricultural sector spending need to be reduced. Instead, these stakeholders view public goods investments in agricultural extension, rural infrastructure, and crop R&D (plus improving smallholders’ access to

credit) as the top spending priorities. These stakeholders' policy preferences are largely consistent with the literature on the types of expenditures that have the highest returns to agricultural growth and/or poverty reduction.

While there is some support among smallholder farmers for increased government spending on rural infrastructure and other agricultural sector public goods,⁷ major sensitization campaigns may be needed to raise awareness of the large likely benefits of these public goods investments. IAPRI's provincial-level outreach efforts are one potential mechanism for this. Such sensitization could help build the kind of broad base of public support needed to effectively encourage government to shift some resources away from FISP and FRA toward agricultural sector public goods. A Zambia-specific study on the returns to different types of government agricultural sector expenditures may help, as some groups with an interest in maintaining status quo government expenditure patterns may write off the evidence from other countries as irrelevant to Zambia.

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⁷ Note that their SOPs are not zero in Figure 5.

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TECHNICAL APPENDIX

APPENDIX A

Policy options, choice sets, and full results for the 2017 E-Voucher Survey BWS

Table A1. Policy options

Increase spending scenario	
(FISP beneficiaries)	Increase the total number of FISP beneficiaries.
(FISP quantity or value)	[<u>Conventional FISP districts</u>] Increase the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [<u>FISP e-voucher districts</u>] Increase the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.
(FRA maize price)	Increase the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”).
(FRA maize quantity)	Increase the total amount of maize that the FRA buys from smallholder farmers.
(Roads & bridges)	Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones).
(Crop R&D)	Develop better crop varieties and crop management practices for smallholder farmers.
(Livestock/fish R&D)	Develop better livestock and fish breeds and management practices for smallholder farmers.
(Irrigation)	Improve access to quality irrigation for smallholder farmers.
(Credit)	Improve access to affordable credit/loans for smallholder farmers.
(Extension agents)	Increase the number of agricultural extension agents available to smallholder farmers.
Decrease spending scenario	
(FISP beneficiaries)	Reduce the total number of FISP beneficiaries.
(FISP quantity or value)	[<u>Conventional FISP districts</u>] Reduce the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [<u>FISP e-voucher districts</u>] Reduce the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.
(FRA maize price)	Reduce the price at which the FRA buys maize from farmers (that is, reduce the FRA “floor price”).
(FRA maize quantity)	Reduce the total amount of maize that the FRA buys from smallholder farmers.
(Roads & bridges)	Reduce spending on improving roads and bridges in the rural areas.
(Crop R&D)	Reduce spending on developing better crop varieties and crop management practices for smallholder farmers.
(Livestock/fish R&D)	Reduce spending on developing better livestock and fish breeds and management practices for smallholder farmers.
(Irrigation)	Reduce spending on improving access to quality irrigation for smallholder farmers.
(Credit)	Reduce spending on improving access to affordable credit/loans for smallholder farmers.
(Extension agents)	Reduce the number of agricultural extension agents available to smallholder farmers.

Note: Short policy option names used in subsequent tables are shown in parentheses.

Figure A1. Choice sets: increase spending scenario⁸

Read by the enumerator: For this set of five questions, we would like you to consider a situation where the Zambian government has 500 million Kwacha in additional funds to spend on the agricultural sector. I will read you lists of four different ways the government could use the money. For each list, we would like to know which option you think is the best (most desirable) use of the money, and which is the worst (least desirable) use of the money.

Choice set 1. Government should use the additional money for the agricultural sector to ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Increase the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Increase the total amount of maize that the FRA buys from smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Develop better livestock and fish breeds and management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Improve access to quality irrigation for smallholder farmers.	<input type="radio"/>

Choice set 2. Government should use the additional money for the agricultural sector to ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Increase the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	[Traditional FISP districts] Increase the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Increase the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Increase the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Develop better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>

⁸ Note that the order of which scenario was presented first (increase spending or cut budget), the order of the choice sets within a given spending scenario, and the order of the policy options within a given choice set were all randomized to reduce the potential for order effects.

Choice set 3. Government should use the additional money for the agricultural sector to ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Increase the total number of FISP beneficiaries.	<input type="radio"/>
<input type="radio"/>	Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones).	<input type="radio"/>
<input type="radio"/>	Increase the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Improve access to quality irrigation for smallholder farmers.	<input type="radio"/>

Choice set 4. Government should use the additional money for the agricultural sector to ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Improve access to affordable credit/loans for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Develop better livestock and fish breeds and management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Develop better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones).	<input type="radio"/>

Choice set 5. Government should use the additional money for the agricultural sector to ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	[Traditional FISP districts] Increase the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Increase the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Increase the total number of FISP beneficiaries.	<input type="radio"/>
<input type="radio"/>	Improve access to affordable credit/loans for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Increase the total amount of maize that the FRA buys from smallholder farmers.	<input type="radio"/>

Figure A2. Choice sets: cut budget scenario

Read by the enumerator: For this set of five questions, we would like you to consider a situation where the Zambian government must cut 500 million Kwacha from its agricultural sector budget. I will read you lists of four different ways the government could cut the budget. For each list, we would like to know which option you think is the best (most desirable) way to cut the budget, and which is the worst (least desirable) way to cut the budget.

Choice set 1. To cut its agricultural sector budget, government should ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Reduce the price at which the FRA buys maize from farmers (that is, reduce the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Reduce the total amount of maize that the FRA buys from smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on developing better livestock and fish breeds and management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on improving access to quality irrigation for smallholder farmers.	<input type="radio"/>

Choice set 2. To cut its agricultural sector budget, government should ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Reduce the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	[Traditional FISP districts] Reduce the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [FISP e-voucher districts] Reduce the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Reduce the price at which the FRA buys maize from farmers (that is, reduce the FRA “floor price”).	<input type="radio"/>
<input type="radio"/>	Reduce spending on developing better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>

Choice set 3. To cut its agricultural sector budget, government should ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Reduce the total number of FISP beneficiaries.	<input type="radio"/>
<input type="radio"/>	Reduce spending on improving roads and bridges in the rural areas.	<input type="radio"/>
<input type="radio"/>	Reduce the number of agricultural extension agents available to smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on improving access to quality irrigation for smallholder farmers.	<input type="radio"/>

Choice set 4. To cut its agricultural sector budget, government should ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	Reduce spending on improving access to affordable credit/loans for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on developing better livestock and fish breeds and management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on developing better crop varieties and crop management practices for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce spending on improving roads and bridges in the rural areas.	<input type="radio"/>

Choice set 5. To cut its agricultural sector budget, government should ...

Most Desirable	Policy option	Least Desirable
<input type="radio"/>	[<u>Traditional FISP districts</u>] Reduce the quantity of subsidized fertilizer and maize seed per FISP beneficiary. [<u>FISP e-voucher districts</u>] Reduce the Kwacha value (government contribution) of the FISP e-voucher per beneficiary.	<input type="radio"/>
<input type="radio"/>	Reduce the total number of FISP beneficiaries.	<input type="radio"/>
<input type="radio"/>	Reduce spending on improving access to affordable credit/loans for smallholder farmers.	<input type="radio"/>
<input type="radio"/>	Reduce the total amount of maize that the FRA buys from smallholder farmers.	<input type="radio"/>

Table A2. Multinomial logit (MNL) and random parameters logit (RPL) parameter estimates – increase spending scenario

Policy option		MNL	Uncorrelated RPL	Correlated RPL
FISP beneficiaries	Mean	0.745*** (0.053)	0.997*** (0.076)	1.083*** (0.084)
	SD		1.098*** (0.088)	1.303*** (0.120)
FISP quantity or value	Mean	0.838*** (0.053)	1.145*** (0.083)	1.243*** (0.095)
	SD		1.312*** (0.095)	1.658*** (0.119)
FRA maize price	Mean	0.584*** (0.053)	0.741*** (0.071)	0.823*** (0.081)
	SD		0.955*** (0.085)	1.219*** (0.112)
FRA maize quantity	Mean	0.113** (0.057)	0.112* (0.067)	0.179** (0.077)
	SD		0.529*** (0.102)	0.958*** (0.099)
Roads & bridges	Mean	0.113*** (0.057)	0.280*** (0.068)	0.293*** (0.071)
	SD		0.896*** (0.082)	0.963*** (0.161)
Crop R&D	Mean	0.151*** (0.051)	0.179*** (0.060)	0.199*** (0.069)
	SD		0.445*** (0.112)	0.881*** (0.087)
Livestock/fish R&D	Mean	-0.043 (0.056)	-0.067 (0.066)	-0.054 (0.073)
	SD		0.544*** (0.095)	0.871*** (0.130)
Irrigation	Mean	-0.052 (0.052)	-0.059 (0.057)	-0.062 (0.063)
	SD		0.165 (0.162)	0.506*** (0.091)
Credit	Mean	0.155*** (0.056)	0.163** (0.073)	0.193** (0.077)
	SD		0.939*** (0.085)	0.950*** (0.189)
Extension agents (base)	Mean	0.000	0.000	0.000
	SD	0.000	0.000	0.000
Number of respondents		710	710	710
Number of choices		3,550	3,550	3,550
Log likelihood		-8,475	-8,299	-8,206
AIC		16,967	16,634	16,520
BIC		17,023	16,745	16,854
LR stat. H ₀ : uncorrelated RPL vs. H ₁ : correlated RPL (36 d.o.f., p-value in parentheses)			185.924*** (0.000)	

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table A3. MNL and RPL parameter estimates – decrease spending scenario

Policy option		MNL	Uncorrelated RPL	Correlated RPL
FISP beneficiaries	Mean	-0.498*** (0.052)	-0.555*** (0.057)	-0.649*** (0.068)
	SD		0.359*** (0.123)	0.884*** (0.107)
FISP quantity or value	Mean	-0.479*** (0.051)	-0.537*** (0.061)	-0.642*** (0.076)
	SD		0.677*** (0.082)	1.225*** (0.106)
FRA maize price	Mean	-0.465*** (0.051)	-0.503*** (0.055)	-0.599*** (0.071)
	SD		0.184 (0.181)	1.020*** (0.118)
FRA maize quantity	Mean	-0.210*** (0.055)	-0.225*** (0.059)	-0.289*** (0.070)
	SD		0.183 (0.205)	0.844*** (0.178)
Roads & bridges	Mean	-0.067 (0.051)	-0.064 (0.061)	-0.092 (0.071)
	SD		0.729*** (0.081)	1.096*** (0.351)
Crop R&D	Mean	-0.159*** (0.051)	-0.166*** (0.054)	-0.202*** (0.067)
	SD		0.279** (0.136)	0.956*** (0.190)
Livestock/fish R&D	Mean	-0.047 (0.055)	-0.034 (0.063)	-0.066 (0.074)
	SD		0.596*** (0.087)	1.070*** (0.270)
Irrigation	Mean	-0.008 (0.051)	0.013 (0.060)	-0.022 (0.067)
	SD		0.639*** (0.084)	0.913*** (0.244)
Credit	Mean	0.050 (0.055)	0.088 (0.065)	0.049 (0.071)
	SD		0.710*** (0.083)	0.854*** (0.158)
Extension agents (base)	Mean	0.000	0.000	0.000
	SD	0.000	0.000	0.000
Number of respondents		710	710	710
Number of choices		3,550	3,550	3,550
Log likelihood		-8,664	-8,605	-8,520
AIC		17,345	17,246	17,149
BIC		17,401	17,357	17,482
LR stat. H ₀ : uncorrelated RPL vs. H ₁ : correlated RPL (36 d.o.f., p-value in parentheses)				169.562*** (0.000)

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table A4. Shares of preferences – increase vs. decrease spending scenarios

Policy option	MNL				Uncorrelated RPL				Correlated RPL			
	Increase		Decrease		Increase		Decrease		Increase		Decrease	
	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank
<i>Spending scenario:</i>												
FISP quantity or value	0.167	1	0.073	9	0.224	1	0.072	8	0.226	1	0.070	8
FISP beneficiaries	0.152	2	0.072	10	0.179	2	0.067	10	0.178	2	0.065	10
FRA maize price	0.130	3	0.074	8	0.133	3	0.070	9	0.135	3	0.069	9
Roads & bridges	0.091	4	0.111	5	0.084	4	0.1162	3	0.084	4	0.116	5
Credit	0.084	5	0.124	1	0.079	5	0.133	1	0.080	5	0.131	1
Crop R&D	0.084	6	0.101	6	0.069	6	0.098	6	0.066	6	0.096	6
FRA maize quantity	0.081	7	0.096	7	0.066	7	0.092	7	0.064	7	0.089	7
Extension agents	0.072	8	0.118	2	0.057	8	0.1156	4	0.057	8	0.124	2
Livestock/fish R&D	0.0693	9	0.113	4	0.055	9	0.115	5	0.056	9	0.117	4
Irrigation	0.0687	10	0.117	3	0.053	10	0.121	2	0.053	10	0.123	3

Note: Policy options listed in order of ranking for the increase spending scenario.

Table A5. Likelihood ratio test results for pooled vs. sub-group models

Sub-groups	Spending scenario	LR statistic	p-value
FISP beneficiaries vs. non-beneficiaries	Increase	74.868	0.032
	Decrease	60.940	0.240
FISP e-voucher pilot districts vs. non-pilot districts	Increase	123.345	0.000
	Decrease	99.295	0.000
Female vs. male respondents	Increase	54.172	0.468
	Decrease	59.599	0.279
Small-scale vs. larger-scale farms	Increase	119.432	0.000
	Decrease	79.603	0.013

Notes: LR statistic and p-values are for H_0 : pooled model vs. H_1 : models by sub-group. 54 degrees of freedom for all LR tests.

Table A7. Shares of preferences for sub-groups

PANEL A								
Policy option	FISP beneficiaries (N=517)				FISP non-beneficiaries (N=193)			
	Increase		Decrease		Increase		Decrease	
	Share	Rank	Share	Rank	Share	Rank	Share	Rank
<i>Spending scenario:</i>								
FISP beneficiaries	0.164***	2	0.065**	10	0.206***	1	0.060**	10
FISP quantity or value	0.231***	1	0.068	8	0.189***	2	0.073	8
FRA maize price	0.137*	3	0.066	9	0.125*	3	0.068	9
FRA maize quantity	0.064***	7	0.089	7	0.073***	6	0.087	7
Roads & bridges	0.084	4	0.117***	4	0.083	4	0.1028***	5
Crop R&D	0.072***	6	0.096	6	0.067***	7	0.095	6
Livestock/fish R&D	0.058	8	0.124***	3	0.057	10	0.1029***	4
Irrigation	0.053*	10	0.116***	5	0.058	9	0.130***	2
Credit	0.079	5	0.132***	1	0.076	5	0.154***	1
Extension agents	0.057**	9	0.127	2	0.065**	8	0.127	3
PANEL B								
Policy option	FISP e-voucher pilot districts (N=452)				Non-pilot districts (N=258)			
	Increase		Decrease		Increase		Decrease	
	Share	Rank	Share	Rank	Share	Rank	Share	Rank
<i>Spending scenario:</i>								
FISP beneficiaries	0.189**	2	0.064	10	0.168**	2	0.064	8
FISP quantity or value	0.205***	1	0.072***	8	0.302***	1	0.060***	10
FRA maize price	0.147***	3	0.068***	9	0.115***	3	0.061***	9
FRA maize quantity	0.070***	6	0.087	7	0.052***	8	0.086	7
Roads & bridges	0.081	4	0.108***	5	0.079	4	0.1214***	3
Crop R&D	0.063***	7	0.099***	6	0.072***	5	0.087***	6
Livestock/fish R&D	0.0545	9	0.120	3	0.055	7	0.1209	4
Irrigation	0.0538***	10	0.134***	1	0.043***	10	0.098***	5
Credit	0.079***	5	0.131***	2	0.061***	6	0.148***	2
Extension agents	0.056**	8	0.118***	4	0.051**	9	0.154***	1
PANEL C								
Policy option	Small-scale farms (< 2 ha cultivated) (N=380)				Larger-scale farms (≥ 2 ha cultivated) (N=330)			
	Increase		Decrease		Increase		Decrease	
	Share	Rank	Share	Rank	Share	Rank	Share	Rank
<i>Spending scenario:</i>								
FISP beneficiaries	0.155***	2	0.070***	10	0.195***	2	0.0590***	10
FISP quantity or value	0.219	1	0.071	9	0.234	1	0.066	8
FRA maize price	0.122***	3	0.072***	8	0.153***	3	0.0592***	9
FRA maize quantity	0.073***	7	0.095***	7	0.057***	7	0.080***	7
Roads & bridges	0.089***	4	0.113	3	0.075***	5	0.117	5
Crop R&D	0.077***	6	0.099***	6	0.061***	6	0.091***	6
Livestock/fish R&D	0.0629***	9	0.111***	5	0.052***	8	0.132***	2
Irrigation	0.060***	10	0.112***	4	0.046***	10	0.126***	4
Credit	0.078	5	0.133*	1	0.076	4	0.141*	1
Extension agents	0.0634***	8	0.125	2	0.049***	9	0.128	3

Notes: All results based on correlated RPL estimates. See Supplemental Online Appendix Tables A1, A2, and A3 for parameter estimates. ***, **, and * denote that we reject, at the 1%, 5%, and 10% levels, respectively, the null hypothesis that the two sub-groups' mean shares of preferences are the same for a given policy option based on two-tailed unpaired t-tests.

Table A8. Correlated RPL parameter estimates: FISP beneficiaries vs. non-beneficiaries

Policy option		Increase spending scenario		Decrease spending scenario	
		FISP beneficiary HH?		FISP beneficiary HH?	
		Yes	No	Yes	No
FISP beneficiaries	Mean	1.049*** (0.100)	1.248*** (0.168)	-0.604*** (0.081)	-0.803*** (0.138)
	SD	1.332*** (0.131)	1.366*** (0.209)	0.919*** (0.121)	0.973*** (0.198)
FISP quantity or value	Mean	1.379*** (0.108)	0.928*** (0.196)	-0.659*** (0.093)	-0.594*** (0.138)
	SD	1.555*** (0.137)	2.023*** (0.233)	1.349*** (0.122)	1.062*** (0.204)
FRA maize price	Mean	0.889*** (0.096)	0.713*** (0.161)	-0.591*** (0.085)	-0.672*** (0.140)
	SD	1.223*** (0.112)	1.377*** (0.211)	1.064*** (0.123)	1.100*** (0.229)
FRA maize quantity	Mean	0.157* (0.089)	0.241 (0.162)	-0.262*** (0.084)	-0.392*** (0.144)
	SD	0.881*** (0.120)	1.327*** (0.189)	0.880*** (0.129)	1.057*** (0.288)
Roads & bridges	Mean	0.297*** (0.085)	0.306** (0.144)	-0.045 (0.087)	-0.266* (0.137)
	SD	1.005*** (0.176)	1.090*** (0.190)	1.192*** (0.221)	1.057*** (0.187)
Crop R&D	Mean	0.189*** (0.080)	0.210 (0.138)	-0.191** (0.082)	-0.257** (0.130)
	SD	0.863*** (0.105)	1.030*** (0.206)	1.061*** (0.142)	0.950*** (0.229)
Livestock/fish R&D	Mean	-0.092 (0.087)	-0.029 (0.150)	-0.007 (0.091)	-0.207 (0.140)
	SD	0.900*** (0.145)	1.142*** (0.194)	1.206*** (0.173)	0.997*** (0.244)
Irrigation	Mean	-0.088 (0.072)	-0.025 (0.139)	-0.023 (0.083)	0.008 (0.131)
	SD	0.360*** (0.135)	1.014*** (0.180)	1.075*** (0.103)	0.936*** (0.227)
Credit	Mean	0.161* (0.092)	0.179 (0.154)	0.018 (0.085)	0.157 (0.141)
	SD	1.013*** (0.159)	1.135*** (0.288)	0.931*** (0.179)	0.874*** (0.254)
Extension agents (base)	Mean	0.000	0.000	0.000	0.000
	SD	0.000	0.000	0.000	0.000
Number of respondents		517	193	517	193
Number of choices		2,585	965	2,585	965
Log likelihood		-5,926	-2,243	-6,194	-2,296
AIC		11,960	4,594	12,497	4,699
BIC		12,276	4,857	12,813	4,962

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table A9. Correlated RPL parameter estimates: FISP e-voucher pilot vs. non-pilot districts

Policy option		Increase spending scenario		Decrease spending scenario	
		FISP e-voucher pilot district?		FISP e-voucher pilot district?	
		Yes	No	Yes	No
FISP beneficiaries	Mean	1.086*** (0.102)	1.115*** (0.158)	-0.593*** (0.083)	-0.797*** (0.130)
	SD	1.216*** (0.134)	1.618*** (0.193)	0.822*** (0.136)	1.209*** (0.170)
FISP quantity or value	Mean	1.004*** (0.112)	1.688*** (0.178)	-0.538*** (0.090)	-0.865*** (0.146)
	SD	1.587*** (0.143)	1.834*** (0.197)	1.098*** (0.128)	1.565*** (0.224)
FRA maize price	Mean	0.826*** (0.101)	0.793*** (0.137)	-0.519*** (0.086)	-0.806*** (0.134)
	SD	1.272*** (0.137)	1.315*** (0.190)	0.928*** (0.138)	1.325*** (0.184)
FRA maize quantity	Mean	0.205** (0.099)	0.078 (0.123)	-0.247*** (0.086)	-0.404*** (0.133)
	SD	1.103*** (0.140)	0.665*** (0.185)	0.752*** (0.146)	1.176*** (0.188)
Roads & bridges	Mean	0.269*** (0.088)	0.266** (0.126)	-0.064 (0.081)	-0.207 (0.142)
	SD	0.985*** (0.132)	1.072*** (0.211)	0.821*** (0.148)	1.569*** (0.200)
Crop R&D	Mean	0.078 (0.082)	0.428*** (0.135)	-0.126 (0.078)	-0.412*** (0.132)
	SD	0.756*** (0.126)	1.340*** (0.161)	0.734*** (0.174)	1.357*** (0.212)
Livestock/fish R&D	Mean	-0.116 (0.092)	-0.035 (0.134)	0.016 (0.086)	-0.265* (0.148)
	SD	0.918*** (0.138)	1.196*** (0.239)	0.798*** (0.173)	1.589*** (0.325)
Irrigation	Mean	-0.063 (0.079)	-0.092 (0.112)	0.111 (0.084)	-0.305*** (0.126)
	SD	0.543*** (0.145)	0.726*** (0.202)	0.872*** (0.227)	1.197*** (0.201)
Credit	Mean	0.272*** (0.098)	-0.005 (0.134)	0.056 (0.083)	0.033 (0.141)
	SD	1.115*** (0.187)	0.983*** (0.286)	0.588*** (0.155)	1.292*** (0.211)
Extension agents (base)	Mean	0.000	0.000	0.000	0.000
	SD	0.000	0.000	0.000	0.000
Number of respondents		452	258	452	258
Number of choices		2,260	1,290	2,260	1,290
Log likelihood		-5,242	-2,903	-5,427	-3,043
AIC		10,592	5,913	10,963	6,195
BIC		10,901	6,192	11,272	6,473

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table A10. Correlated RPL parameter estimates: small- vs. larger-scale farms

Policy option	<i>Farm size:</i>	Increase spending scenario		Decrease spending scenario	
		Small-scale (<2 ha cult.)	Larger-scale (≥ 2 ha cult.)	Small-scale (<2 ha cult.)	Larger-scale (≥ 2 ha cult.)
FISP beneficiaries	Mean	0.834*** (0.110)	1.451*** (0.139)	-0.523*** (0.083)	-0.825*** (0.121)
	SD	1.210*** (0.158)	1.487*** (0.16908)	0.586*** (0.142)	1.317*** (0.163)
FISP quantity or value	Mean	1.019*** (0.129)	1.608*** (0.146)	-0.545*** (0.092)	-0.763*** (0.132)
	SD	1.682*** (0.151)	1.599*** (0.16775)	0.925*** (0.148)	1.593*** (0.157)
FRA maize price	Mean	0.633*** (0.095)	1.134*** (0.145)	-0.468*** (0.087)	-0.793*** (0.121)
	SD	0.842*** (0.138)	1.708*** (0.16256)	0.782*** (0.212)	1.334*** (0.166)
FRA maize quantity	Mean	0.155 (0.103)	0.253** (0.123)	-0.216** (0.088)	-0.400*** (0.117)
	SD	0.964*** (0.150)	1.051*** (0.14560)	0.602*** (0.223)	1.135*** (0.184)
Roads & bridges	Mean	0.244*** (0.090)	0.351*** (0.113)	-0.100 (0.088)	-0.082 (0.119)
	SD	0.834*** (0.147)	1.059*** (0.19096)	0.848*** (0.292)	1.359*** (0.268)
Crop R&D	Mean	0.195** (0.090)	0.220** (0.107)	-0.163* (0.087)	-0.251** (0.106)
	SD	0.792*** (0.155)	1.010*** (0.12993)	0.861*** (0.225)	1.073*** (0.182)
Livestock/fish R&D	Mean	-0.034 (0.093)	-0.094 (0.123)	-0.136 (0.093)	0.050 (0.122)
	SD	0.728*** (0.154)	1.219*** (0.25451)	0.807*** (0.303)	1.342*** (0.184)
Irrigation	Mean	0.016 (0.082)	-0.174* (0.104)	-0.062 (0.088)	0.037 (0.109)
	SD	0.399*** (0.130)	0.823*** (0.21775)	0.792 (0.765)	1.085*** (0.241)
Credit	Mean	0.106 (0.100)	0.299** (0.123)	0.033 (0.090)	0.072 (0.113)
	SD	0.861 (0.573)	1.098*** (0.34127)	0.688** (0.343)	0.983*** (0.224)
Extension agents (base)	Mean	0.000	0.000	0.000	0.000
	SD	0.000	0.000	0.000	0.000
Number of respondents		380	330	380	330
Number of choices		1,900	1,650	1,900	1,650
Log likelihood		-4,464	-3,683	-4,613	-3,868
AIC		9,035	7,474	9,333	7,844
BIC		9,335	7,766	9,633	8,136

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

APPENDIX B

Policy options, choice sets, and full results for the 2019 Stakeholder Survey BWS

Table B1. Policy options

Increase spending scenario	
(FISP)	Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary
(FRA)	Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers
(Roads & bridges)	Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones)
(Crop R&D)	Develop better crop varieties and crop management practices for smallholder farmers.
(Credit)	Improve access to affordable credit/loans for smallholder farmers
(Extension agents)	Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers
(Regulatory capacity)	Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products
Decrease spending scenario	
(FISP)	Decrease spending on the Farmer Input Support Program (FISP) by decreasing the number of beneficiaries and/or by decreasing the Kwacha value (government contribution) or quantity of inputs per beneficiary
(FRA)	Decrease spending on the Food Reserve Agency (FRA) by decreasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by decreasing the total amount of maize that the FRA buys from smallholder farmers
(Roads & bridges)	Decrease spending on improving roads and bridges in the rural areas
(Crop R&D)	Decrease spending on developing better crop varieties and crop management practices for smallholder farmers
(Credit)	Decrease spending on improving access to affordable credit/loans for smallholder farmers
(Extension agents)	Reduce the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers
(Regulatory capacity)	Decrease spending to improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products

Note: Short policy option names used in subsequent tables are shown in parentheses.

Figure B1. Choice sets: increase spending scenario

For this set of seven questions, we would like you to consider a situation where the Zambian government has 500 million Kwacha in additional funds to spend on the agricultural sector. Each question lists four different ways the government could use the money. For each list, we would like to know which option you think is the best (most desirable) use of the money, and which is the worst (least desirable) use of the money. Each option will appear on multiple lists of four. This is ok. Please consider only the four options on a given list when deciding which option you think is the best use of the money and which is the worst use of the money on that particular list. For each column, please only select one option.

****Note**:** *order of options in a given question is randomized.*

Choice set 1. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	<input type="radio"/>	<input type="radio"/>
Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers	<input type="radio"/>	<input type="radio"/>
Improve access to affordable credit/loans for smallholder farmers	<input type="radio"/>	<input type="radio"/>
Develop better crop varieties and crop management practices for smallholder farmers	<input type="radio"/>	<input type="radio"/>

Choice set 2. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones)	<input type="radio"/>	<input type="radio"/>
Develop better crop varieties and crop management practices for smallholder farmers	<input type="radio"/>	<input type="radio"/>
Improve access to affordable credit/loans for smallholder farmers	<input type="radio"/>	<input type="radio"/>
Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	<input type="radio"/>	<input type="radio"/>

Choice set 3. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O
Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Improve access to affordable credit/loans for smallholder farmers	O	O
Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O

Choice set 4. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers	O	O
Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones)	O	O
Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O
Improve access to affordable credit/loans for smallholder farmers	O	O

Choice set 5. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O
Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers	O	O
Develop better crop varieties and crop management practices for smallholder farmers	O	O
Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O

Choice set 6. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones)	O	O
Increase spending on the Food Reserve Agency (FRA) by increasing the price at which the FRA buys maize from farmers (that is, increase the FRA “floor price”) and/or by increasing the total amount of maize that the FRA buys from smallholder farmers	O	O
Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Improve regulatory capacity (i.e., more inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O

Choice set 7. Government should use the additional money for the agricultural sector to ...

	Most Desirable	Least Desirable
Develop better crop varieties and crop management practices for smallholder farmers	O	O
Increase spending on the Farmer Input Support Program (FISP) by increasing the number of beneficiaries and/or by increasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O
Increase the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Improve roads and bridges in the rural areas (for example, repair existing roads/bridges or build new ones)	O	O

Figure B2. Choice sets: cut budget scenario

For this set of seven questions, we would like you to consider a situation where the Zambian government must cut 500 million Kwacha from its agricultural sector budget. Each question lists four different ways the government could cut the budget. For each list, we would like to know which option you think is the best (most desirable) way to cut the budget, and which is the worst (least desirable) way to cut the budget. For each column, please only select one option.

****Note**:** *order of options in a given question is randomized*

Choice set 1. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending on improving roads and bridges in the rural areas	O	O
Decrease spending on developing better crop varieties and crop management practices for smallholder farmers	O	O
Decrease spending on Improving access to affordable credit/loans for smallholder farmers	O	O
Decrease spending to improve regulatory capacity (i.e., increase inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O

Choice set 2. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending to improve regulatory capacity (i.e., increase inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O
Reduce the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Decrease spending on the Farmer Input Support Program (FISP) by decreasing the number of beneficiaries and/or by decreasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O
Decrease spending on Improving access to affordable credit/loans for smallholder farmers	O	O

Choice set 3. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending on the Farmer Input Support Program (FISP) by decreasing the number of beneficiaries and/or by decreasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	<input type="radio"/>	<input type="radio"/>
Decrease spending to improve regulatory capacity (i.e., increase inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	<input type="radio"/>	<input type="radio"/>
Decrease spending on the Food Reserve Agency (FRA) by decreasing the price at which the FRA buys maize from farmers (that is, decrease the FRA “floor price”) and/or by decreasing the total amount of maize that the FRA buys from smallholder farmers	<input type="radio"/>	<input type="radio"/>
Decrease spending on developing better crop varieties and crop management practices for smallholder farmers	<input type="radio"/>	<input type="radio"/>

Choice set 4. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending on the Food Reserve Agency (FRA) by decreasing the price at which the FRA buys maize from farmers (that is, decrease the FRA “floor price”) and/or by decreasing the total amount of maize that the FRA buys from smallholder farmers	<input type="radio"/>	<input type="radio"/>
Decrease spending on the Farmer Input Support Program (FISP) by decreasing the number of beneficiaries and/or by decreasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	<input type="radio"/>	<input type="radio"/>
Decrease spending on Improving access to affordable credit/loans for smallholder farmers	<input type="radio"/>	<input type="radio"/>
Decrease spending on improving roads and bridges in the rural areas	<input type="radio"/>	<input type="radio"/>

Choice set 5. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending on improving roads and bridges in the rural areas	O	O
Decrease spending on the Food Reserve Agency (FRA) by decreasing the price at which the FRA buys maize from farmers (that is, decrease the FRA “floor price”) and/or by decreasing the total amount of maize that the FRA buys from smallholder farmers	O	O
Reduce the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Decrease spending to improve regulatory capacity (i.e., increase inspectors, better enforcement) to ensure that farm inputs (such as pesticides, seeds, fertilizer, veterinary supplies, etc.) available to farmers meet quality standards and are not counterfeit products	O	O

Choice set 6. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Reduce the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Decrease spending on improving roads and bridges in the rural areas	O	O
Decrease spending on developing better crop varieties and crop management practices for smallholder farmers	O	O
Decrease spending on the Farmer Input Support Program (FISP) by decreasing the number of beneficiaries and/or by decreasing the Kwacha value (government contribution) or quantity of inputs per beneficiary	O	O

Choice set 7. To cut its agricultural sector budget, government should ...

	Most Desirable	Least Desirable
Decrease spending on developing better crop varieties and crop management practices for smallholder farmers	O	O
Decrease spending on the Food Reserve Agency (FRA) by decreasing the price at which the FRA buys maize from farmers (that is, decrease the FRA “floor price”) and/or by decreasing the total amount of maize that the FRA buys from smallholder farmers	O	O
Reduce the number of well-trained and well-resourced agricultural extension agents available to smallholder farmers	O	O
Decrease spending on Improving access to affordable credit/loans for smallholder farmers	O	O

Table B2. MNL and RPL parameter estimates – increase spending scenario

Policy option		MNL	Uncorrelated RPL	Correlated RPL
FISP	Mean	-1.208*** (0.153)	-2.511*** (0.378)	-3.338*** (0.522)
	SD		1.954*** (0.272)	2.496*** (0.392)
FRA	Mean	-1.635*** (0.161)	-3.408*** (0.482)	-4.212*** (0.586)
	SD		2.951*** (0.593)	2.666*** (0.399)
Roads & bridges	Mean	0.783*** (0.146)	1.190*** (0.222)	1.236*** (0.224)
	SD		0.969*** (0.238)	0.538** (0.263)
Extension	Mean	1.386*** (0.152)	1.987*** (0.258)	2.138*** (0.311)
	SD		1.327*** (0.281)	1.614*** (0.350)
Crop R&D	Mean	0.453*** (0.136)	0.680*** (0.201)	0.739*** (0.244)
	SD		0.886*** (0.237)	1.248*** (0.350)
Credit	Mean	0.411*** (0.143)	0.651** (0.259)	0.781*** (0.278)
	SD		1.411*** (0.259)	1.487*** (0.366)
Regulatory capacity (base)	Mean	0.000	0.000	0.000
	SD	0.000	0.000	0.000
Number of respondents		62	62	62
Number of choices		434	434	434
Log likelihood		-792	-706	-689
AIC		1,596	1,436	1,432
BIC		1,621	1,485	1,542
LR stat. H ₀ : uncorrelated RPL vs. H ₁ : correlated RPL (15 d.o.f., p-value in parentheses)			34.606*** (0.003)	

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table B3. MNL and RPL parameter estimates – decrease spending scenario

Policy option		MNL	Uncorrelated RPL	Correlated RPL
FISP	Mean	0.961*** (0.154)	2.871*** (0.516)	3.518*** (0.589)
	SD		3.490*** (0.518)	3.921*** (0.625)
FRA	Mean	1.501*** (0.164)	3.409*** (0.562)	4.784*** (0.712)
	SD		4.516*** (0.732)	4.601*** (0.723)
Roads & bridges	Mean	-1.027*** (0.153)	-1.531*** (0.265)	-2.044*** (0.339)
	SD		1.578*** (0.314)	2.014*** (0.343)
Extension	Mean	-1.857*** (0.163)	-2.950*** (0.370)	-3.692*** (0.510)
	SD		2.125*** (0.486)	3.103*** (0.526)
Crop R&D	Mean	-0.845*** (0.143)	-1.227*** (0.197)	-1.725*** (0.315)
	SD		0.621** (0.294)	1.592*** (0.359)
Credit	Mean	-0.862*** (0.151)	-1.409*** (0.279)	-1.802*** (0.367)
	SD		1.510*** (0.262)	2.153*** (0.334)
Regulatory capacity (base)	Mean	0.000	0.000	0.000
	SD	0.000	0.000	0.000
Number of respondents		62	62	62
Number of choices		434	434	434
Log likelihood		-757	-645	-610
AIC		1,527	1,313	1,274
BIC		1,551	1,362	1,384
LR stat. H ₀ : uncorrelated RPL vs. H ₁ : correlated RPL (15 d.o.f., p-value in parentheses)			69.296*** (0.000)	

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors in parentheses.

Table B4. Shares of preferences – increase vs. decrease spending scenarios

Policy option	MNL				Uncorrelated RPL				Correlated RPL			
	Increase		Decrease		Increase		Decrease		Increase		Decrease	
	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank	Share	Rank
<i>Spending scenario:</i>												
Extension	0.371	1	0.016	7	0.434	1	0.006	7	0.445	1	0.009	7
Roads & bridges	0.203	2	0.038	6	0.189	2	0.022	5	0.175	2	0.032	4
Credit	0.140	4	0.0446	5	0.147	3	0.024	4	0.147	3	0.029	5
Crop R&D	0.146	3	0.0454	4	0.118	4	0.012	6	0.118	4	0.014	6
Regulatory capacity	0.093	5	0.106	3	0.053	5	0.046	3	0.058	5	0.041	3
FISP	0.028	6	0.276	2	0.0301	6	0.296	2	0.033	6	0.284	2
FRA	0.018	7	0.474	1	0.0297	7	0.594	1	0.025	7	0.590	1

Note: Policy options listed in order of correlated RPL ranking for the increase spending scenario.

APPENDIX C

Experimental designs for the 2017 E-Voucher Survey and 2019 Stakeholder Survey BWSs

The choice sets were generated using a nearly balanced incomplete block design (NBIBD) (Street and Street, 1996; Lagerkvist, Okello and Karanja, 2012; Bazzani et al., 2018) for the 2017 E-Voucher Survey and a balanced incomplete block design (BIBD) (Auger, Devinney and Louviere, 2007) for the 2019 Stakeholder Survey. The NBIBD design is balanced but not orthogonal, while the BIBD design is both balanced and orthogonal. Balanced means that all choice sets contain the same number of policy options (four in the case of the two BWSs implemented in this policy brief). In orthogonal designs, each policy option appears with each other policy option an equal number of times. In the 2017 E-Voucher Survey, each of the 10 policy options appeared two times across the design and each pair of policies appeared an average of 0.66 times. In the 2019 Stakeholder Survey, each of the 7 policy options appeared 4 times across choice sets and co-occurred with each other policy option 2 times.

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APPENDIX D

Overview of analysis – multinomial logit and random parameters logit models, and shares of preference (based on Lusk & Briggeman, 2009)

If we assume homogeneous policy preferences across respondents and that the error terms follow a type I extreme value distribution, then the probability of a given best-worst (BW) pair of policy options being chosen takes on the multinomial logit (MNL) form:

$$Prob(j \text{ is chosen best \& } k \text{ is chosen worst}) = \frac{e^{\lambda_j - \lambda_k}}{\sum_{l=1}^J \sum_{m=1}^J e^{\lambda_l - \lambda_m} - J}$$

where λ_j is the location of option j on an underlying desirability scale.

Once we have estimated the λ_j 's, we can use them to compute the “share of preference” (SOP) for policy option j as follows:

$$\text{Share of preference for policy } j = \frac{e^{\widehat{\lambda}_j}}{\sum_{k=1}^J e^{\widehat{\lambda}_k}}$$

An SOP is the forecasted probability that policy option j is chosen as the most desirable.

If we estimate the models via random parameters logit (RPL) instead of MNL, this allows preferences to be heterogeneous across respondents in the sense that each respondent (i) has his/her own set of preference parameters (λ_{ij} instead of λ_j for all j). Shares of preferences can then be calculated for each individual as follows, and then the mean and standard deviation of the SOPs calculated:

$$\text{Share of preference for policy } j \text{ for respondent } i = \frac{e^{\widehat{\lambda}_{ij}}}{\sum_{k=1}^J e^{\widehat{\lambda}_{ik}}}$$

Reference

Lusk, J. L. and Briggeman, B. C. (2009). Food values. *American Journal of Agricultural Economics* 91(1): 184–196.

