AGRICULTURE AND LIVESTOCK MOTIVATIONS AND BARRIERS STUDY

AMALIMA LOKO STUDY REPORT

June 8, 2022

This study report was made possible by the support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of CNFA and do not necessarily reflect the views of USAID or the United States Government.

This publication was produced by CNFA under the USAID-funded Amalima Loko activity.

Amalima Loko Agreement No. 72DFFP20CA00008

Period of Study:

December 2021 – March 2022

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Acronyms and Abbreviations

ADRA	Adventist Development and Relief Agency
AGRITEX	Department of Agricultural, Technical, and Extension Services
BHA	Bureau for Humanitarian Assistance
DVS	Department of Veterinary Services
FGD	Focus Group Discussion
IDI	In-Depth Interview
KII	Key Informant Interview
NGO	Non-Governmental Organization
OPV	Open-Pollinated Variety
USAID	United States Agency for International Development
VSL	Village Savings and Loans

Executive Summary

The Amalima Loko program is a five-year USAID/ Bureau for Humanitarian Assistance (BHA)-funded Resilience Food Security Activity (RFSA) designed to improve food and nutrition security in Zimbabwe through increased food access and sustainable watershed management. The program is implemented in Matabeleland North by a consortium led by CNFA and comprised of the Organization of Rural Associations for Progress, Dabane Water Workshops, The Manoff Group, International Medical Corps, and Mercy Corps.

Introduction

As part of its Refine and Implement Phase, Amalima Loko studied why farmers choose to adopt (or not adopt) new agriculture and/or livestock practices and technologies. Understanding the motivations and barriers behind farmers' decisions about new practices will help the program tailor its strategies and interventions and, ultimately, increase the uptake of improved practices.

Research objectives:

- Identify improved agriculture and livestock practices already adopted by farmers, broken down by household types/ profiles
    - Identify factors that motivated households to adopt
- Identify improved agriculture and livestock practices introduced to farmers but not adopted broken down by household types/ profiles
    - Identify barriers to adoption for non-adopters
- Understand the motivation for households/ farmers to purchase livestock and what might motivate them to see livestock as a productive asset
- Identify those agriculture and livestock management practices which have the highest potential for adoption and how farmers can be motivated (what farmers require) to adopt these practices

Methodology

Amalima Loko conducted the study in two project districts in northwestern Zimbabwe, Binga and Lupane. The study used purposive sampling because it helped the research team easily identify subjects that fit into the study objectives. Specifically, this sampling approach guaranteed that the researcher examined farmers that have either adopted or not adopted the promoted practices ("doers" or "non-doers," respectively).[1] The Amalima Loko research team conducted 72 in-depth interviews (IDIs) at the household level (48 in Binga, 24 in Lupane), 24 focus group discussions (FGDs) (16 in Binga, 8 in Lupane), and ten key informant interviews (KIIs) (six in Binga, four in Lupane). The research team collected and transcribed data from January 19 to February 9, 2022. Data coding and analysis began on February 19 and ran through March 1, 2022.

[1] Doers are farmers who practice in full or in part any one of the recommended crop or livestock practices. Non-doers are those who do not practice any of the recommended practices after exposure to them.

Key Findings

Table 1 outlines the study's key findings by research question.

Table 1: Key findings by research question

Research question	Key findings
1. What are the primary motivations behind crop and livestock production (i.e., food, income, status, wealth store, cultural norms, etc.)?	The motivations for crop and livestock production are similar in the two districts. The motivations can be categorized as (1) economic and (2) social. Consumption and income are the main motivations for crop and livestock production, including the decision to grow cash crops. Access to milk, meat, and eggs is a motivation for keeping livestock. Social factors, including enhanced social status from livestock ownership and having the ability to provide food for one's family, motivate farmers to grow crops and keep livestock. Farmers in both Binga and Lupane cited that livestock is used as part of social and cultural formalities such as paying bride prices (with cattle and goats) and for ritual slaughter.
2. How do motivations affect production practices and the adoption of recommended improved practices?	While the study established why farmers produce crops and livestock, the effect of these motivations on the adoption of recommended practices remains unclear. While farmers are aware of the benefits of raising cattle, goats, and chickens (including for crop production), this awareness has not translated into the widespread adoption of practices—such as vaccination and improved livestock housing—that could improve livestock well-being. The study did find instances of congruence between a farmer's motivation and production practices. For example, farmers, motivated by the need to improve yields for enhanced food security and possible sales, regularly use manure to improve soil fertility. More than 90 percent of the surveyed farmers who own cattle and goats acknowledged that they dig up manure and use it in their fields to improve soils.
3. What motivated doers to adopt the introduced improved practices? What steps did they take to adopt the new behavior? Who were the key actors involved?	When deciding whether to adopt improved practices, farmers have both (1) endogenous incentives and (2) exogenous incentives. Identified endogenous/intrinsic factors include perceived ease of use and the attitude of farmers toward a practice. Exogenous/extrinsic factors mainly have to do with cost. Farmers are more likely to adopt low-cost (or free) practices. For example, 14 percent of crop farmers interviewed (IDIs) reported that free inputs (improved seed, synthetic fertilizer) available through the Presidential Input Scheme motivated them to plant improved hybrid seed varieties/open-pollinated varieties (OPV). This contrasts with 72 percent of farmers who cited the "high costs" of seed as a deterrent. These views were corroborated by findings from FGDs and KIIs.

Research question	Key findings
	Awareness (or lack thereof) of improved practices influences adoption as well. Farmers who adopted improved seed said their decision was informed, in part, by information provided by Agritex officers. Similarly, farmers who vaccinate their livestock against common diseases cite extension officers from the Department of Veterinary Services (DVS) as an influence. The farmers suggested that consulting and working closely with extension officers was a key step in adopting an improved practice.
4. Are the motivators and barriers to adoption the same/similar/different for the various agriculture and livestock management practices?	The study revealed a mixed bag of motivators and barriers for the various agriculture and livestock practices. In some instances, the motivators and barriers to adoption are similar across practices; in other instances, both the barriers and motivators are different. The following factors matter for all practices: (1) perceived benefits, (2) perceived high costs, (3) socio-cultural factors, and (4) negative farmer perceptions. Perceived benefits, unsurprisingly, greatly affect whether farmers (of crops and livestock) adopt improved practices for both crop and livestock production. On the other hand, regardless of the benefits associated with improved practices, if the cost of implementing a practice is perceived to be high, farmers are less likely to adopt the practice. For example, non-adopters in both Binga and Lupane reported that they have not adopted improved hybrid and OPV seed varieties because they are "expensive" when compared to retained seed. High costs also discouraged some farmers from using artificial fertilizers to improve their soils. On livestock behaviors, less than five percent of surveyed farmers (IDIs) supplement their livestock with commercial feed, citing the high cost of feed as a deterrent.
5. What are the barriers to adoption for non-doers who have been introduced to improved management practices? What is the extent of the knowledge of the new practices that non-doers have?	While the barriers to the adoption of improved behaviors are diverse, they can be categorized broadly as (1) endogenous and (2) exogenous. Lack of individual drive is an endogenous barrier that affects an individual's willingness to adopt a practice. Individual preferences can be a barrier to adopting improved behaviors. For example, 83 percent of the surveyed farmers (IDIs) acknowledged that although they are well-versed with soil and moisture conservation techniques, the desire to avoid drudgery was a major reason for not adopting these labor-intensive practices. The perceived cost of an improved practice is the main exogenous barrier to adoption. The cost of many agricultural practices—seed, fertilizer, vaccines, commercial feed—comes upfront (i.e., before a farmer sees the value). For instance, 16 of the 36 livestock IDI respondents said the expense prevented them from providing supplementary feeding, vaccinating their livestock, and building improved livestock handling and housing facilities. Crop producers had similar comments about hybrid seed. The farmers who cited

Research question	Key findings
	these barriers acknowledged that they are fully aware of the benefits of adopting these improved practices. The decision to adopt promoted practices may also be informed by negative experiences. The experiences might have happened to the farmer or to someone the farmer knows. Farmers in Binga and Lupane (IDIs, FGDs) cited instances where some hybrid seed distributed under the Presidential Input Scheme did not germinate. This experience discouraged them and other farmers from planting hybrid seed varieties. Some farmers, meanwhile, believe that vaccines "kill" livestock. Some farmers think the Newcastle disease vaccine kills chickens when, in fact, chickens could have died as a result of poor vaccine administration by community volunteers or the vaccination of sick birds. Institutional factors also prevent farmers from taking up promoted practices. One such barrier cited by farmers and corroborated by extension agents is the lack of improved seed varieties on the market in Binga. An agro-dealer said they had stopped selling improved seed—maize, in particular—because of a lack of demand (even at competitive prices i.e., equivalent to those of Bulawayo-based outlets).
6. What might convince non-doers who have not adopted an improved behavior to do so? What are their top reasons for trying or not trying the behavior?	The study proposes several ways to motivate non-doers to adopt improved behaviors. The suggested incentives include capacity building (e.g., look-and-learn visits, demonstrations, training) and participation in village savings and loans (VSL) and livestock groups. Key informants stressed that training should emphasize "practical activities" such as look-and-learn visits and demonstrations for all promoted behaviors. As noted above, cost is a major determinant of whether a farmer adopts an improved practice. Farmers appear willing to try out the less costly practices but will avoid high-cost practices—even when they have perceived benefits. To address the barrier of costs, development partners should encourage farmers to form and join savings clubs and groups. These groups can strengthen the financial management capacity of farmers while also helping inculcate banking behavior into the rural community more generally. When fully embraced, savings groups and clubs may help expose communal farmers to formal financial institutions such as microfinance institutions and banks. Livestock groups should be established to improve livestock management by educating farmers on improved practices such as vaccination and the benefits of improved livestock handling and housing. Livestock groups can work hand in hand with VSLs with the latter being a vehicle to raise funds to improve livestock management.

Research question	Key findings
7. For all the above questions, how do gender dynamics impact adoption vs. non-adoption? What strategies/ messaging are more or less effective for males and females?	Gender dynamics influence the adoption or non-adoption of new behaviors depending on whether households are female or male-headed. The study suggested that men tend to have the final say when deciding whether to adopt promoted practices. The study also established that there is gendered division of labor with men taking the more strenuous roles, such a tree stumping and construction of cattle kraals. This might lead to constrained adoption of laborious practices amongst female headed households. A notable finding from KIIs is that more women participate in training than men. As such, women are more likely to be exposed to learning by doing, which can drive the adoption of improved practices. Also, the greater participation of women in training helps incubate the social learning that can lead to the adoption of improved practices. Given that less men participate in community meetings, other platforms need to be used to increase men's participation.

1. Background and Introduction

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As part of its Refine and Implement Phase, Amalima Loko studied why farmers choose to adopt or not adopt new agriculture and/or livestock practices and technologies. Understanding the motivations and barriers behind farmers' decisions will help the program tailor its strategies and interventions and, ultimately, better promote the adoption of improved practices.

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First, Amalima Loko defined a set of recommended agricultural and livestock practices (behaviors) to analyze. These practices included:

1. **Planting improved regionally appropriate hybrid/OPV seed varieties**

   Farmers plant improved hybrid/OPV small grain (pearl millet, sorghum) varieties that are early maturing and drought-tolerant.

2. **Using soil and moisture conservation techniques such as conservation agriculture**

   Farmers dig basins/open furrows and apply mulch (animal manure, compost, leaf material)/fertilizer (inorganic) at planting.

3. **Vaccinating cattle, goats, and chickens against common diseases**

   Farmers vaccinate cattle (against quarter evil, anthrax, lumpy skin disease), goats (against pulpy kidney disease), and chickens (against Newcastle disease).

4. **Providing supplementary feeding to livestock during the dry season**

   Farmers provide supplementary feeding to cattle, goats, and chickens during the dry season (June-December) with crop stovers, grass, homemade feed mixes, and/or commercial feed.

5. **Using improved livestock handling facilities**

   Farmers use a race with/without a crush to handle livestock during vaccination, treatment, or inspection.

6. **Using improved livestock housing facilities**

   Farmers use roofed housing with adequate ventilation to house calves, goats, and chickens

Section 1.1 explores these practices in more depth, drawing on the program's literature review, which examined factors influencing the adoption of promoted practices. Section 2 describes the study's methodology, which used qualitative methods in recognition of the importance of drawing out participant experiences, attitudes, and perceptions and how they affect farmers' behavior. Section 3 presents key findings, while Section 4 offers recommendations.

1.1 Literature Review

This section provides an overview of the literature on the adoption of technology by smallholder farmers. It explores the factors influencing the adoption of promoted practices. The literature review also cites an applicable theoretical framework that describes and explains the factors influencing farmer behavior.

Technology Adoption in Agriculture: A Global Overview

Improved practices contribute to increased productivity and overall agricultural development. Despite these benefits, improved practices have not been consistently adopted by smallholder farmers. The process farmers in developing countries use to decide whether to adopt innovation is quite complex and, as such, requires intense interrogation.[2] This view is shared by Masere and Worth, who acknowledge that numerous factors affect the adoption of technology by small-scale farmers.[3] These factors include technology attributes (such as potential productivity gains after adoption, simplicity of use, cost); farmer circumstances (such as demographics, the scale of operation/land size, perception about the technology, affordability, access to credit facilities, availability and accessibility of knowledge and information support about the technology); and their operating environment (e.g., climatic factors, soil factors, slope, location in relation to road networks).[4] Saengavut and Jirasatthumb go further, categorizing this multiplicity of factors as intrinsic and extrinsic, as detailed below.[5]

Intrinsic Variables

<u>Attitude toward technology adoption intention</u>

The attitude of the farmer plays a crucial role in the decision-making process.[6] Masere and Worth conclude it is the most crucial factor to consider is how the farmer perceives a technology.[7] For example, when farmers receive information about a new agricultural opportunity, this information forms the basis of the perceptions and attitudes developed toward the technology early in the decision-making process.[8] It is these evaluated perceptions that influence farmer behaviors.[9]

<u>Perceived ease of use</u>

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[2] Voravee Saengavut and Norachit Jirasatthumb, "Smallholder decision-making process in technology adoption intention: implications for Dipterocarpus alatus in Northeastern Thailand," Elsevier 2021: 2,3
[2] T.P Masere and S. Worth, "Influence of public agricultural extension on technology adoption by small-scale farmers in Zimbabwe," South African Journal of Agricultural Extension, Volume 49, No 2, 2021
[4] Ibid.
[5] Voravee Saengavut and Norachit Jirasatthumb, "Smallholder decision-making process in technology adoption intention," 2021
[6] Ibid.
[7] T.P Masere and S. Worth, "Influence of public agricultural extension on technology adoption by small-scale farmers in Zimbabwe," South African Journal of Agricultural Extension, Volume 49, No 2, 2021
[8] Voravee Saengavut and Norachit Jirasatthumb, "Smallholder decision-making process in technology adoption intention," 2021
[9] Ibid.

Perceived ease of use also influences farmers' decision-making. Perceived ease of use is the belief that a product or service will be free of physical, technical, intellectual, and other complications. Drawing on the research of others, Saengavut and Jirasatthumb report that perceptions around the ease with which technology can be used is a critical determinant in adoption.[10]

Extrinsic Variables

Age

Age plays a role in encouraging and or impeding behavior change in people. For example, a study on agroforestry technologies in cocoa production indicated that younger farmers may be more willing than older ones to adopt new technologies, and take risks more generally.[11] However, more research is needed to study the effect of age on behavior change; quantitative research, in particular, could be useful in correlating age to other variables that explain behavior.

Cost of implementation

Numerous studies have suggested that the cost of implementing a technology influences whether a farmer adopts a new practice.[12] Farmers weigh adoption benefits versus costs. Saengavut and Jirasatthumb, for example, argue that a net gain from using the new technology is a critical factor in the adoption process, especially for farmers in developing economies.[13] Although there are several facets to implementation costs, capital spending (on the innovation itself) is usually the decisive factor. This finding is evident in real-life cases. For instance, a study found that a drop in subsidies for seed and fertilizers in Malawi prevented some farmers from taking up conservation agriculture.[14] Beyond capital costs, intellectual costs play a role. By intellectual cost we mean whether the adoption of a new behavior requires new knowledge (e.g., about contemporary production methods).

Experience and farmer characteristics

A farmer's experiences influence whether they will adopt promoted practices. Saengavut and Jirasatthumb, for example, argue that experience is based on an individual's social background and value-forming attitudes, and this forms the assessment processes which influence decision-making.[15] The farmer's experience is a lens through which he compares current and new practices and, thus, is a factor influencing adoption or non-adoption.[16]

Environmental views around sustainable agriculture

Another exogenous factor influencing the uptake of new behaviors is the farmer's perspective on the environment. The "environment perspective" consists of the farmer's views on the quality of the environment, his or her conservation attitudes and beliefs, and their ecological worldviews.[17] According to Thompson et al., a farmer's willingness to commit to either a different or a conventional agriculture system is related to their environmental worldview.[18]

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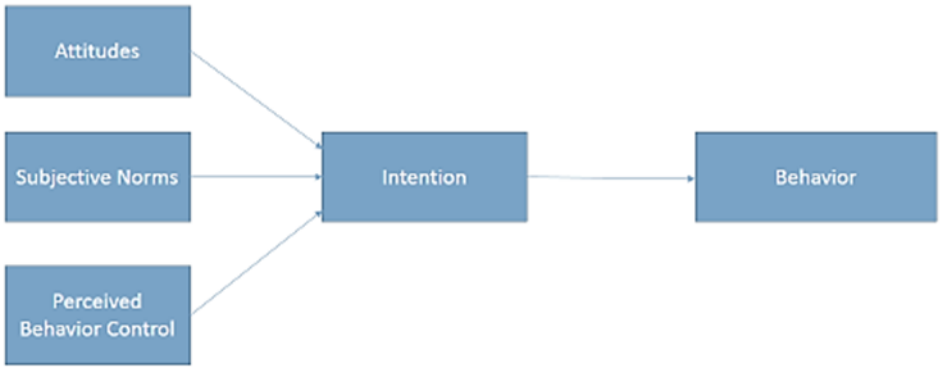
[10] Ibid.
[11] Ibid.
[12] Ibid.
[13] Ibid.
[14] W. Muzari, W. Gatsi, S. Muvhunzi, "The impacts of technology adoption on smallholder agricultural productivity in sub–Saharan Africa: a review," J. Sustain. Dev 5, 2012
[15] Ibid.
[16] Ibid.
[17] S.A. Henning, Y. Zhong, and H. Cardona, "Ecological attitudes of farmers and adoption of best management practices," Southwestern Econom. Proceed. 31 (2), 57–70, 2012
[18] A.W. Thompson, A. Reimer, and L.S. Prokopy, "Farmers' views of the environment: the influence of competing attitude frames on landscape conservation efforts, Agric. Hum. Val. 32 (3), 385–399, 2015

Theoretical Framework

The literature cited above is consistent with the "Theory of Planned Behavior/Theory of Reasoned Action," which offers a model for farmer decision-making (see Figure 1). The model suggests that the likelihood of a person adopting a certain behavior depends on (1) attitudes – an individual's beliefs, worldviews, and opinions of a particular behavior, (2) subjective norms – these determine whether a particular behavior is considered normal as compared to what peers are doing, and (3) perceived behavioral control – which relates to either how easy it is for an individual to implement a particular behavior and/or the extent to which they feels in control of the decision-making process.[19]

The Theory of Planned Behavior is helpful to this study in two ways. First, the theory offers a model for understanding how resource-poor smallholder farmers decide whether to take up promoted technologies. Second, the model suggests that one's attitude and perceptions inform his or her behavior. Understanding attitudes and behavior will help Amalima Loko better target its interventions.

Figure 1: Theory of Planned Behavior



Adapted from Ajzen, 1991[20]

Agriculture Technology Adoption in Zimbabwe

In Zimbabwe, government extension workers are the leading promoters of improved agricultural practices and technologies, through non-governmental organizations (NGOs) and the private sector also play a role. However, small-scale farmers have not adopted most of the methods recommended by the Department of Agricultural, Technical, and Extension Services (Agritex). Some research attributes this to farmers' dependence on "indigenous knowledge" (i.e., what has worked for them in the past).[21] Extension agents perceive this knowledge as an impediment to technology adoption.[22] More generally, research in Zimbabwe shows that farmers are resistant to change and slow to accept outside help, including new and

[19] Voravee Saengavut and Norachit Jirasatthumb, "Smallholder decision-making process in technology adoption intention," 2021
[20] Ajzen, I. 1991. The theory of planned behavior, Organizational Behavior and Human Decision Processes, 50 (2): 179-211
[21] T.P Masere and S. Worth, "Influence of public agricultural extension on technology adoption by small-scale farmers in Zimbabwe," South African Journal of Agricultural Extension, Volume 49, No 2, 2021
[22] Ibid.

modern technology.[23] This finding points to a need to invest in participatory approaches, including farmer-driven technology development and menus of alternatives, to ensure farmers can decide what they may need.[24]

Perhaps conforming to the tenets of the Theory of Planned Behavior, Masere and Worth submit that the most crucial factor determining technology adoption among smallholder farmers in Zimbabwe is how the farmer perceives a technology.[25] Afterward, the farmer may look at their circumstances to see if they permit adoption.

Conservation Agriculture (CA)

CA has been widely promoted in Zimbabwe to preserve soil health and mitigate the impacts of climate change considerations. Mugandani, for example, points out that CA has been promoted in Zimbabwe to combat the decline in soil fertility, restore degraded land, and stabilize yields in smallholder farming systems.[26] The adoption of CA practices in Zimbabwe, however, has been limited, with only an estimated 8.3 percent of total arable land being managed using the principles of conservation agriculture (as of 2014).[27]

Among the reasons for the limited adoption of CA is its labor intensity. For example, minimizing soil disturbance increases the need for manual weeding.[28] This view is supported by a farmer in Tsholotsho, who remarked that:

> "Conservation farming (Gatshompo) is unsuitable for the elderly farmers. Digging holes and removing weeds at least three times is not what they are used to. Although in my opinion, the yields are higher than on conventionally tilled land the intense labor involved is simply a deterrent. They cannot cope especially in the face of a scorching sun.[29]"

Knowledge is another factor influencing the adoption of conservation agriculture approaches. When farmers move from conventional systems to conservation agriculture, they must learn new agronomic and land management techniques.[30] As such, lack of knowledge has been cited as one of the significant challenges to the early adoption of conservation agriculture.[31] Lack of equipment is also a considerable constraint to the adoption of conservation agriculture practices.[32]

Hybrid and regionally appropriate seed

While some smallholder farmers in Zimbabwe are already growing drought-resistant crops to cope with climate change, uptake has rather been disappointing. Researchers for the "Impact of adoption of drought-tolerant maize varieties on total maize production in southeastern Zimbabwe" study, for example, asked households that did not grow drought-tolerant maize varieties the reasons behind their decisions. In Chiredzi, households that did not grow drought-tolerant maize varieties cited three main reasons: (1) "lack of finance" to purchase maize seeds on the market, (2) "poorly labelled drought-tolerant maize

[23] Ibid.
[24] Ibid.
[25] Ibid.
[26] Raymond Mugandani, "Conceptualising conservation agriculture adoption in Zimbabwe," UKZ, 2020
[27] M. Richards, et al., Conservation Agriculture: Implementation guidance for policymakers and investors, Rome, 2014
[28] Leonard Rusinamhodzi, "Tinkering on the periphery: labour burden not crop productivity increased under no-till planting basins on smallholder farms in Murehwa district, Zimbabwe," Field Crops Research, 170, 66–75, 2015
[29] Rodney Witman Lunduka, Kumbirai Ivyne Mateva, Cosmos Magorokosho, and Pepukai Manjeru, "Impact of adoption of drought-tolerant maize varieties on total maize production in south Eastern Zimbabwe," Climate and Development., 11:1, 35-46, 2019
[30] Raymond Mugandani, "Conceptualising conservation agriculture adoption in Zimbabwe"
[31] Ibid.
[32] Ibid.

packages,'" and (3) "unavailability of drought-tolerant maize at [the] local market."[33] These findings were mirrored in Chipinge.[34] (Similar sentiments were also revealed in this study.) Other studies report similar findings and delve into the obstacles farmers face in adopting drought-tolerant maize in Southern Africa, including the inaccessibility of improved seed, insufficient information and resources, high seed prices, and the farmers' negative perceptions of the seed variety.[35]

The "Small grains 'resistance'? Making sense of Zimbabwean smallholder farmers' cropping choices and patterns within a climate change context" study found that despite efforts to promote small grains in Zimbabwe, production has been on the decline.[36] Among the reasons offered are labor-related challenges among smallholder farmers in sorghum and millet processing. In response, farmers turn to maize production, which is less burdensome than the cultivation of sorghum and millet. Another preference for maize is for its crop residue to be used as stover and organic matter for increasing soil fertility.[37]

Small grains production is also unappealing to smallholder farmers for other reasons. One reason is that the crops are attractive to red-billed *quelea* birds, which, in particular, have been an ongoing challenge on small grain crops in Zimbabwe. In addition, the uptake of small grains is also hampered by the cost of small grains seed. Farmers also prefer maize because of the taste and the higher yield potential in a year where rainfall is average. In Tsholotsho, studies revealed that most seed retailers stock more maize seed varieties than sorghum or pearl millet.[38] This could be because stocking decisions are largely driven by turnover rates (i.e., seed may sell faster than small grain seed). The limited availability of seed is an issue not only in Tsholotsho but also in the rest of Zimbabwe.

Livestock supplementary feeding

Livestock—cattle, goats, sheep, pigs, chickens, and other farm animals—is a lifeline for many of the world's poorest people. Livestock production is growing more difficult, however. Persistent drought in many areas, for example, requires communal farmers to provide supplementary feeding over a longer period, increasing production costs. It is in this context that most communal cattle farmers in Zimbabwe have embraced preserving and using crop residues as a short-term dry season feed measure. This preference also stems from a lack of funds to buy stock feed.[39]

2. Methodology

This study sought to identify the motivations and barriers behind farmers' decisions to adopt or not adopt six promoted cropping and livestock practices in Binga and Lupane districts in Matabeleland North Province in Zimbabwe. A qualitative methodology was appropriate in this case because the study sought to understand farmers' perspectives, knowledge, experiences, attitudes, and needs. More details on the methodology can be found below.

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[33] Rodney Witman Lunduka, Kumbirai Ivyne Mateva, Cosmos Magorokosho, and Pepukai Manjeru, "Impact of adoption of drought-tolerant maize varieties on total maize production in south eastern Zimbabwe"
[34] Ibid.
[35] Ibid.
[36] Keith Phiri, Thulani Dube, Philani Moyo, Cornelias Ncube & Sibonokuhle Ndlovu | (2019) Small grains "resistance"? Making sense of Zimbabwean smallholder farmers' cropping choices and patterns within a climate change context, Cogent Social Sciences, 5:1, 1622485, DOI: 10.1080/23311886.2019.1622485
[37] Ibid.
[38] Ibid.
[39] Thabo Ndlovu, "Coping with drought: Reflection of communal cattle farmers in Umzingwane district in Zimbabwe," Jàmbá: Journal of Disaster Risk Studies 11(1), a813, 2019

2.1 Study Area

The research team conducted this study in Binga and Lupane districts, two areas where Amalima Loko operates (see figure 2).

Binga district is in north-western Zimbabwe. Typically a low-lying area, Binga falls mostly under agro-ecological zone five (though a small part of Binga, Lusulu, is classified as agro-ecological zone three). The soil in the district is sandy with low inherent fertility. The district receives low, erratic rainfall (350 – 500mm per annum), which limits crop production; it also experiences high temperatures. The district is well known for its substantial wildlife population, which sometimes affects crop and livestock production through human-wildlife conflicts. Due to the proximity to the Zambezi River and Kariba Dam, fishing is a key livelihood.

Lupane is also located in north-western Zimbabwe. Most of the district falls under agro-ecological region four. Rainfall is rather low, averaging 500 – 600mm per annum. Summers are hot, and winters are dry and cool. This climate predisposes farmers to a mixed farming system although the conditions are favorable for livestock production. Lupane has significant resources including limestone, methane gas, and timber.

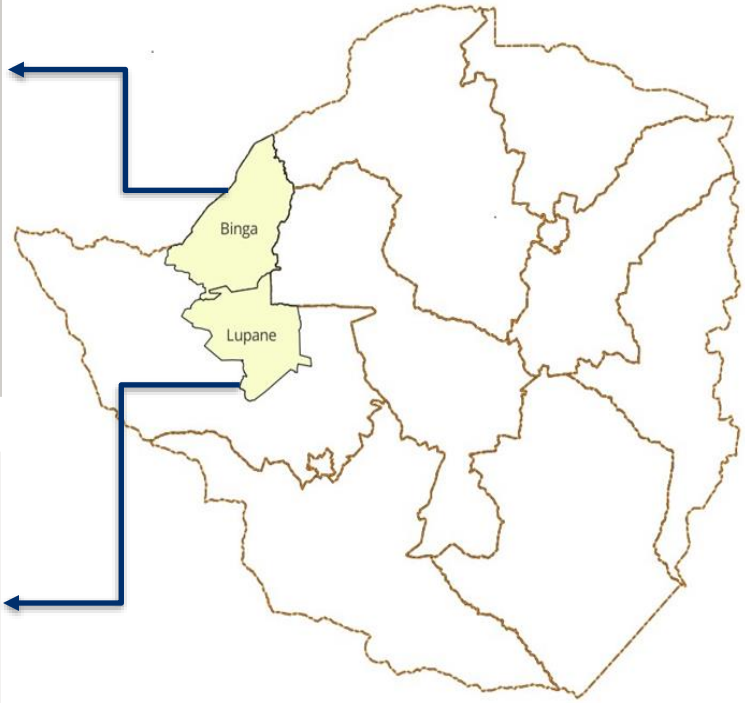

Figure 2: Study Location

2.2 Sampling

The study used two-staged purposive sampling because it helped the research team easily identify subjects that fit into the study objectives. Specifically, this sampling approach guaranteed that the researcher examined farmers that have either adopted or not adopted the promoted practices ("doers" or "non-doers").[40] Program staff conducted 72 in-depth interviews at the household level (48 in Binga, 24 in Lupane), 24 focus group discussions (16 in Binga, 8 in Lupane), and ten key informant interviews (six in Binga, four in Lupane).

Participants in the IDIs and FGDs were divided into two main categories: "doers" and "non-doers." The study identified doers and non-doers through a two-stage process. First, Amalima Loko staff engaged community-based Agritex and DVS agents to help develop lists of "good" and "not so good" farmers divided by crop and livestock producers. "Good" represented the doers while "not so good" represented

[40] Doers are defined as those farmers who practice in full or in part any one of the recommended crop or livestock practices. Non-doers are defined as those who do not practice any of the recommended practices after exposure to them.

the non-doers. The team arrived at this nomenclature after the field-testing study tools in Tsholotsho, where they found this is how Agritex and DVS agents differentiated doers from non-doers. The second stage used interview screening questions to help the enumerators confirm the participants' classification as a doer or non-doer. Key informants were purposively selected from both districts.

Study Demographics

Gender. Women accounted for 63 percent of the study respondents; men made up the remaining 37 percent (more women than men participated in both the FGDs and IDIs).

Age. The study divided the respondents into two age groups: (1) youth (18-35 years) and (2) those over the age of 36. Youth made up 28 percent of study participants; the remaining 72 percent of the IDI and FGD respondents were over the age of 36. The comparatively limited number of youth participants could be the result of high migration rates among youth, who move to other (mostly urban) areas in search of employment.

Education. Most study participants had primary school education, though more than 25 percent had secondary education (see Figure 3).

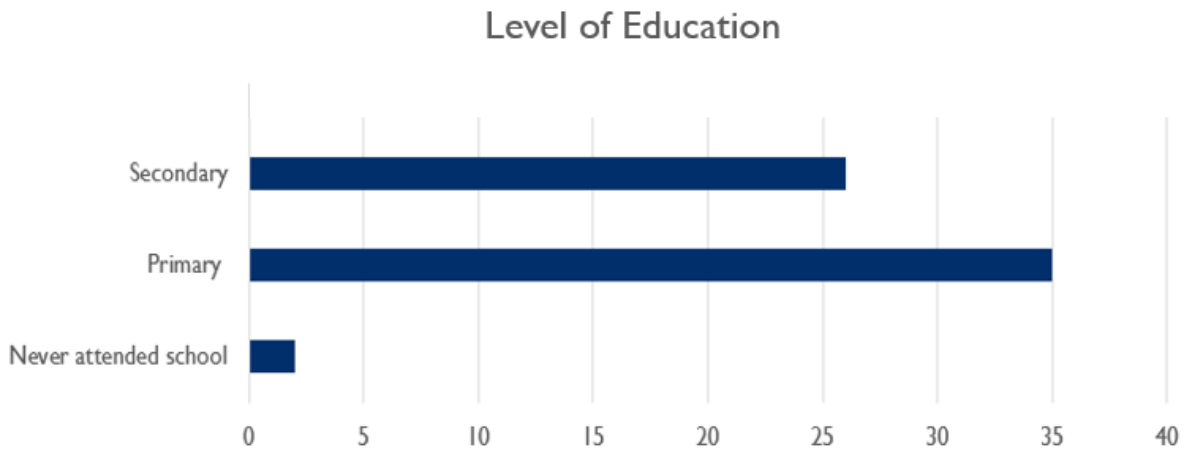

Figure 3: Level of Education

2.3 Development of Data Collection Tools

The Lead Investigator led the development of the study tools. The draft tools were then discussed and improved in a two-day meeting with selected subject experts at Amalima Loko. The study tools included (I) in-depth interview tools for household interviews (tailored to crops and livestock), (2) focus group discussion tools for livestock and crop production behaviors targeted at female and male farmers, and (3) key informant interview tools targeted at Agritex staff (district and ward), DVS staff (district and ward), community leaders (headman, chiefs, village heads, councilors), and agro-dealers.

The IDI tools were designed to explore the factors promoting or impeding the adoption of recommended practices at an individual level while FGDs enabled the study to understand better the factors promoting or discouraging adoption. Dividing the FGDs into men's and women's groups helped isolate any gendered differences (albeit in a rather subliminal manner) in factors that affect technology. The KIIs were designed to elicit more informed input into the inquiry. As such, "difficult" questions on socio-cultural determinants of technology adoption were included in the KIIs. The enumerators received three days of training, which focused on the study objectives, study tools, and research protocols.

Research Questions

1. What are the primary motivations behind crop and livestock production (i.e., food, income, status, wealth store, cultural norms, etc.)?
2. How do motivations affect production practices and the adoption of recommended improved practices?
3. What motivated doers to adopt the introduced improved practices? What steps did they take to adopt the new behavior? Who were the key actors involved?
    - What challenges did adopters face and how did they overcome them?
    - What are the key elements that enable these farmers to practice the new behaviors?
    - What messages would they give to convince fellow farmers to adopt the new behavior?
4. Are the motivators and barriers to adoption the same/similar/different for the various agriculture and livestock management practices?
5. What are the barriers to adoption for non-doers who have been introduced to improved management practices? What is the extent of the knowledge of the new practices that non-doers have?
    - Have the non-doers tried to adopt new practices? What are their reasons for sticking with these practices?
    - What factors motivate non-doers to continue using other practices despite having been introduced to new ones? What are the attitudes and impressions of non-doers on new practices? What practices are they using instead of the recommended ones?
6. What might convince non-doers who have not adopted an improved behavior to do so? What are their top reasons for trying or not trying the behavior?
7. For all the above questions, how do gender dynamics impact adoption vs. non-adoption? What strategies/messaging are effective for males and females?

Testing and finalizing the tools

The team tested the tools in Tsholotsho. This testing phase entailed conducting six IDIs (split equally between livestock and crop production behaviors), three KIIs (covering ward-based extension officers, a councilor, and an agro-dealer), and four FGDs. The team revised the study tools based on feedback (in discussion with the Amalima Loko team) before deploying them for data collection.

2.4 Data Collection and Analysis

Data collection commenced in Lupane on January 18, 2022, and in Binga on January 19, and continued through January 27. Between January 31 and February 9, 2022, the team transcribed data and sent the transcripts to the Lead Researcher. After collating the transcripts, the Lead Researcher led the team in developing a codebook that would inform the coding in Dedoose (February 15-18, 2022). Coding began on February 19 and continued through March 1, 2022. Coding ensured that responses gathered in the study were categorized into the various thematic areas as ordered in the codebook.

2.5 Study Limitations

The study faced several limitations. While qualitative methods are effective for studying subtle nuances in attitudes and behaviors, they do not produce statistical descriptions. As such, the study findings focus on describing farmer attitudes and behaviors as well as the factors underpinning such attitudes. In addition,

in the absence of such statistical data, the study deliberately avoided using variables such as age, gender, and level of education to explain the motivation of farmers to adopt or not adopt recommended practices. Accordingly, the statistics presented in this report are merely descriptive, describing single variables.

3. Findings

This section is organized around the research questions.

3.1 What are the primary motivations behind crop and livestock production (i.e., food, income, status, wealth store, cultural norms, etc.)?

The study established that motivations for producing crops and livestock were similar in both districts. Also common were the types of crops and livestock being produced. For example, cattle, goats, and indigenous chickens were the most common livestock kept by farmers in both Binga and Lupane. Other poultry species such as guinea fowl, turkeys, and pigeons were also popular with farmers in both districts. Some farmers in Binga also kept pigs. While the motivations for keeping livestock vary by species, they fall into two broad categories (1) economic motivation and (2) social motivations. Within the two major classifications, are also sub-classifications such as farmer attitudes to promoted practices, farmer experience (either personal or observed) with the different practices, and perceptions of ease of use. These motivations apply to crops as well, as described below.

Economic Motivations

Livestock Production

One of the main reasons farmers keep livestock is the benefits afforded to crop production, the main livelihood of many smallholder farmers. For example, cattle are a source of draught power for tillage and transport; farmers also use cattle to transport inputs and farm produce. Even farmers who rely on donkeys for draught power and transportation indicated a preference for cattle. Manure was also a reason to keep cattle and goats. Unable to afford synthetic fertilizer, most farmers rely on manure.

In addition, household consumption was a key motivator. Cattle and, in some instances, goats provide milk (for domestic consumption and in some cases local sales), meat, and other valuable by-products such as hides. The consumption incentive is also evident in small livestock production, primarily chickens. Chickens provide meat and eggs for home consumption and can also be sold to generate income.

Farmers in Binga and Lupane (FGDs) also report using livestock as stores of value. Livestock (mainly chickens and goats) can be sold to pay for school fees, medical costs, and other household expenses. Chickens, in particular, are used in barter trade, which is a vital part of "cashless" rural communities. Chickens are also used as a form of payment for services rendered (e.g., farm labor, the construction of livestock housing). In addition, 44 percent of respondents viewed livestock (cattle) as a store of value that can be liquidated at appropriate times. This according to the farmers is one of the major incentives for cattle ownership.

Crop Production

Maize, sorghum, and pearl millet were the three major crops produced by farmers in Binga and Lupane. Most respondents said their motivations were subsistence (household consumption and income). A farmer from Lubu in Binga was direct, saying "we get our food through farming." This partly explains the popularity

of cereal crops among farmers. Farmers stressed that they grow certain crops to generate income, which explains reports of growing cash crops. Of the three main crops mentioned, red sorghum was the primary "cash" crop. KIIs and FGDs in both Binga and Lupane revealed that some farmers have contracts for red sorghum with two off-takers (Delta and Ingwebu). Of the surveyed farmers, 19 percent (IDIs) said they are motivated to grow crops since they can use crop residue to feed their livestock. Farmers also use crops as a medium of payment and for barter trade.

Social Motivations

Livestock Production

Farmers also keep livestock, cattle, and goats for social reasons. Raising cattle can enhance a farmer's social status, for example. Cattle and goats are also used for social and cultural practices (e.g., the payment of bride prices, ritual slaughter).

3.2 How do motivations affect production practices and the adoption of recommended improved practices?

The study did not find a strong relationship between existing production practices and farmers' motivation to adopt recommended practices. For example, while there is a clear relationship between livestock and crop production, the effect of these motivations on the adoption of recommended livestock practices is ambiguous. Despite being aware of livestock's contribution to crop productivity, the adoption of practices to improve the health, safety, and wellbeing of livestock is limited. Outside of free government-initiated vaccination campaigns (covering anthrax, foot and mouth disease, and Newcastle disease), less than five percent of the surveyed farmers have vaccinated livestock against common killer diseases such as lumpy skin disease, blackleg, and heartwater.

Some instances of congruence between a farmer's motivation and production practices, however, are evident. For instance, the farmers said the manure production is a major motivator for keeping cattle and goats (more than 80 percent of the surveyed farmers who own cattle and goats said they dig up manure and use it in their fields to improve soils). However, it is unclear if the use of manure for soil improvement is a result of intrinsic motivation or a necessity (more than 90 percent of the surveyed farmers faced financial constraints that make it difficult to buy fertilizer).

While the economic benefits of livestock (cattle, goats, and chickens) and crops (maize, sorghum, and pearl millet) among the surveyed farmers cannot be overstated, the effect of these economic motivations on production practices is mixed. This finding suggests that negative characteristics can outweigh positive benefits. For example, while features such as high yield potential make an improved seed attractive, the crop is perceived to be susceptible to pests and diseases, unpalatable, and has a poor shelf life.

Similarly, the study did not find a strong relationship between social motivations and the adoption of recommended practices. Given the significance of cattle, goats, and chickens in cultural practices, for example, one would expect corresponding investment in the well-being of livestock (i.e., in vaccination, improved housing and handling). Still, the adoption of the recommended practices remains low.

3.3 What motivated doers to adopt the introduced improved practices? What steps did they take to adopt the new behavior? Who were the key actors involved?

Doers adopted improved behaviors for a range of different reasons. These motivations can be divided into two main categories, which apply to both livestock and crop production: (1) endogenous incentives and (2) exogenous incentives. Each category is discussed in more detail below.

Endogenous Incentives

Perceived Ease of Use

Perceived ease of use influences a farmer's decision to adopt a new practice. Ease of use is nurtured by simple and clear product labeling. Some farmers who have begun planting improved seeds say clear labeling makes it easy to grow improved varieties. A farmer in Lupane pointed out that the labels on hybrid seed packs are easy to understand and "… answer all her questions."

Farmers' Attitude toward a Practice

Unsurprisingly, a farmer with a positive attitude toward a promoted behavior is more likely to adopt it. A positive attitude can be cultivated by providing farmers opportunities to "see" or "hear" about the benefits of a practice. Extension agents and social networks (relatives, friends, and neighbors) play important roles in shaping farmers' attitudes toward agricultural practices. A female farmer in Lupane (IDI, ward 18), for example, said she took up supplementary feeding after observing its benefits on a neighbor's homestead. In three years of providing supplementary feeding to his cattle, the neighbor had not lost a single animal to drought. Seeing the benefits in person motivated the farmer to adopt supplementary feeding despite the high cost of commercial feed. Other farmers concurred and added that it helped to see cattle in good condition and health. Observed protection from predation and resistance to notifiable disease similarly cultivated positive attitudes toward practices such as "use of improved livestock housing" and "vaccination of cattle, goats, and chickens against common diseases."

Exogenous Incentives

Availability

Fourteen percent of farmers (IDIs) reported that they planted improved hybrid/OPV pearl millet and sorghum varieties (early maturing, drought-tolerant) because the seed is easily accessible through the Presidential Input Scheme. Some farmers pointed out that these free inputs enabled them to evaluate the efficacy of hybrid seed varieties for themselves. Adoption was also facilitated by the awareness-raising efforts of extension service providers.

Perceived Cost of Practice

The cost of a practice influences whether a farmer will adopt it. Farmers are more likely to adopt those low-cost or even free practices. As noted above, 14 percent of crop farmers said the availability of free inputs (hybrid seed, synthetic fertilizer) through the Presidential Input scheme motivated them to plan

improved/OPV seed varieties.[41] By contrast, 72 percent of the farmers said "high costs" deterred them from adopting improved seed (these views were corroborated by findings from FGDs and KIIs).

Cost plays a similar role in the adoption of recommended livestock practices. For instance, some farmers in Binga (FGD) reported having built improved housing facilities for cattle and goats thanks to the almost "zero" cost of building materials such as logs and stones. Similarly, almost all the interviewed farmers in Binga and Lupane said they vaccinate their livestock against notifiable diseases such as anthrax (cattle) and Newcastle disease (chickens) because the government provides the vaccines for free. Another example: More than 90 percent of surveyed farmers use crop residues to supplement feed their cattle because the crop residue from their fields is "free."

Steps toward Adoption

Awareness of recommended practices also drives adoption. Farmers using improved seed said information and outreach by AGRITEX influenced their decisions. Livestock producers also said DVS extension officers informed them about the importance of vaccinating livestock against common notifiable diseases. Six farmers who purchase vaccines through a group said they consult DVS for advice before vaccinating their livestock. "We work in groups, and we meet occasionally to discuss ways of raising money to buy vaccines. We also meet with the Veterinary Officer who will assist us in buying the vaccines," said one farmer from Lupane.

According to the farmers using improved practices, non-adopting farmers should be taught about recommended practices. Farmers said that extension agents and lead farmers should gather farmers, offer training, and convey key messages. They argue that non-adopters will learn more through observation.

3.4 Are the motivators and barriers to adoption the same/ similar/ different for the various agriculture and livestock management practices?

Motivators and barriers to the adoption of recommended practices vary widely. Common motivations across all the practices include perceived benefits and low cost of implementation. Access to free inputs, materials, and implements, for example, unsurprisingly encourages the adoption of improved seed, artificial fertilizer, vaccines, and, to an extent, supplementary feed (in cases where donations are made by NGOs). Positive farmer perceptions also motivated farmers to adopt recommended practices such as supplementary feeding of cattle.

Most farmers cited high costs as the main barrier to adopting recommended practices. Farmers tend to shun technologies with high implementation costs. This finding holds across all six recommended cropping and livestock practices. Unavailability of inputs and material (e.g., seed, vaccine), unsurprisingly, also prevents the adoption of recommended practices.

Below we explore the motivations and barriers to the adoption of the six practices examined in this study.

1. **Planting of improved regionally appropriate hybrid/OPV seed varieties** *(Farmers plant improved hybrid/OPV small grain (pearl millet, sorghum) varieties that are early maturing and drought tolerant.)*

[41] Although the Presidential Input Scheme has been instrumental in getting farmers to plant improved hybrid and OPV seed varieties, the scheme has faced challenges. Farmers in the two districts reported receiving inputs rather late, for example. Farmers also complained that the 5kg seed packs are inadequate to meet their needs. This is one of the reasons causing the farmers to use retained seed.

Farmers who plant regionally appropriate improved hybrid and/or OPV seed varieties said they do so because of the perceived benefits (i.e., high yields, drought tolerance). These benefits, however, do not outweigh the high costs. Non-adopters say they do not use improved hybrid and OPV seed varieties because they are "expensive." This finding explains why 70 percent of adopters report using free seed distributed under the Presidential Inputs Scheme. Farmers also report looking at the overall cost of planting improved seed. For example, farmers believe improved seed are susceptible to pests and disease, which would not only cut yields but also increase costs by necessitating the use of chemical treatments and pesticides.

Some farmers simply lack access to improved seed. Adopting farmers in both Lupane and Binga said that improved seed is not readily available in their localities.

Socio-cultural factors also influence whether a farmer decides to plant improved seed varieties. Farmers in Lupane and Binga say they prefer retained seed varieties because the resulting grains taste better than those grown from hybrid and OPV seed.

Farmer perceptions—a product of their experiences and observations—are also a barrier to the adoption of planting of improved seed varieties. For example, some farmers chose not to plant improved seed after noticing the poor germination of the seed distributed under the Presidential Input Scheme. The negative perception reinforced the farmers' belief in retained seed.

2. **Use of soil and moisture conservation techniques such as conservation agriculture** (*Farmers dig basins/open furrows and apply mulch [animal manure, compost, leaf material]/fertilizer [in-organic] at planting.)*

Cost is a significant factor when deciding whether to apply improved soil and moisture conservation practices. High costs discouraged some farmers from using artificial fertilizers, for example, which explains the reliance on animal manure.

Over 85 percent (IDIs) report that they have not fully adopted conservation agriculture techniques because they are labor-intensive. The need to stump, pothole, apply manure, and weed makes the practices unattractive, especially among elderly farmers and those living with disabilities (although study respondents said drudgery is a concern for all farmers).

Lack of material—mulch in the case of conservation agriculture—was also cited as a barrier.

3. **Vaccination of cattle, goats, and chickens against common diseases** (*Farmers vaccinate cattle [quarter evil, anthrax, lumpy skin disease], goats [pulpy kidney disease], and chickens [Newcastle disease].*)

Cost is a factor in vaccination as well. As is the case with the uptake of improved seed varieties, most farmers who vaccinate their livestock (90 percent) do so using free vaccines provided by the DVS (i.e., for anthrax, foot-and-mouth disease, and Newcastle disease). The same farmers often do not vaccinate against other similarly harmful diseases (e.g., lumpy skin disease and blackleg), citing high costs as the reason.

Often, vaccines are simply unavailable. Some farmers complained that vaccines are not readily available at their local agro-dealers, forcing them to travel to Bulawayo (or send someone on their behalf). This added step increases the cost of the vaccines. As a result, farmers resort to ethnoveterinary practices when their animals fall sick.

In addition, some farmers have a negative perception of vaccinations. For example, some farmers believe the Newcastle vaccine kills chickens, when, in fact, the deaths of vaccinated chickens are likely a result of poorly administered vaccines (by community volunteers) or the vaccination of sick birds.

4. **Supplementary feeding of cattle during the dry season** (*Farmers provide supplementary feeding to cattle, goats, and chickens during the dry season [June-December] with crop stovers, grass, homemade feed mixes, and/or commercial feeds.)*

High costs can prevent farmers from providing supplementary feed to cattle and chickens. As a result of these costs, farmers adopt the practice only in part (i.e., using crop residue rather than commercial feed). Less than five percent of surveyed farmers supplement their cattle with commercial feed, for example. Contrast this percentage with the 95 percent of surveyed farmers (IDIs) who say they use stover, which can be treated by adding molasses to improve palatability) from crop residues and sorghum and pearl millet grain to supplement feed cattle and chickens, respectively. All the farmers agreed that they use stover because it is "affordable," even though it is often inadequate.

Availability is also a factor. Farmers who lack adequate stover for their cattle and the funds for commercial feed often practice relief grazing (i.e., migrating animals to areas with enough grazing) (FGDs, KIIs).

Positive perceptions motivate the adoption of supplementary feeding. As noted above, one farmer in Lupane began supplementary feeding after observing that her neighbor had not lost a single animal in three years of supplementary feeding.

5. **Use of improved livestock handling facilities** (*Farmers use a race with/without a crush to handle livestock during vaccination, treatment, or inspection.)*

While farmers acknowledged the benefits of having their own cattle handling crushes, less than five percent of the surveyed farmers said they had constructed the facilities, citing a lack of resources. Farmers went on to say they have always used affordable methods, such as handling animals with ropes, which has contributed to indifference towards the practice. Also, the farmers said they are also able to use "free" handling facilities at the dip tank. However, observations reveal that the distance to these dip tanks can be considerable, which might inhibit farmers form using the handling facilities when the need arises.

6. **Use of improved livestock housing facilities** *(Farmers use roofed housing with adequate ventilation for the housing of calves, goats, and chickens.)*

Over 40 percent of farmers said they lacked the resources to improve livestock housing. When asked why he had not built an improved kraal for his goats, one farmer in Binga explained, "there are no big trees around. The trees are found far away. We buy the logs." Improving livestock housing is also labor-intensive, requiring farmers not only to build the facilities but also to cut and transport logs. Additionally, one of the barriers to improved housing for poultry was the infestation of diseases if chickens are housed.

The motivations for improving livestock housing include safety (of calves, from predation), increased milk (when calves are housed separately from their mothers), and the ease of collecting manure.

3.5 What are the barriers to adoption for non-doers who have been introduced to improved management practices? What is the extent of the knowledge of the new practices that non-doers have?

Just like the motivations, the barriers to the adoption of improved practices are diverse. They can be divided into two main categories: (1) endogenous barriers and (2) exogenous barriers.

Endogenous Barriers

Individual preference

Individual preference and circumstances can reduce a farmer's willingness (and ability) to adopt improved practices, especially labor-intensive practices associated with soil and moisture conservation. Farmers in Binga and Lupane (KIIs, FGDs) said that some farmers simply prefer the relative ease of conventional farming, despite being aware of the benefits of adopting recommended practices. Although not widespread, indifferent attitudes toward new technologies were also highlighted as a barrier to the adoption of promoted practices.

Exogenous Barriers

Perceived Cost of Practice

Many agricultural practices—the use of improved seed and synthetic fertilizer—require up-front costs. These costs were among the most commonly cited barriers to using improved practices. Hybrid seed, for example, are quite expensive. One farmer even said that often she must sell a goat to buy just one pack of hybrid seed. To minimize these costs, farmers keep planting retained seed.

Another impediment to adoption—which also has cost implications—is the perceived susceptibility of hybrid/OPV maize varieties to pests such as Fall Army Worm in the field and weevils in storage. This perceived susceptibility "necessitates" the purchase of pesticides, which many farmers cannot afford.

Costs also prevent farmers from providing supplementary feed to livestock. Although farmers in Binga and Lupane understand the nutritional benefits of commercial feed, the cost of the feed ($18 for 50kg in Bulawayo for cattle feed, $33 for chickens) is prohibitive. They instead rely on stover from crop residue or relief grazing, both of which are perceived as less costly.

While vaccination of cattle and chickens against anthrax and Newcastle disease, respectively, is almost universal thanks to a free government program, few farmers can afford to vaccinate their livestock against other diseases such as quarter evil (around $8), lumpy skin disease ($40), and pulpy kidney disease ($5). This forces farmers to be reactive, acting only when livestock get sick (e.g., using ethnoveterinary remedies to treat sick animals).

Negative Socio-Cultural Perceptions

Socio-cultural perceptions greatly influence behavior. Some farmers in Lupane, for example, resisted planting improved seeds out of fear that high yields would make them vulnerable to witchcraft attacks from "jealous" enemies. Some 80 percent of farmers in Binga prefer "housing" their indigenous chickens in trees, despite understanding the benefits of improved housing. Cited reasons included (i) it is "their way of doing things," (ii) it makes it very hard for thieves to steal the chickens as compared to when the chickens are in a coop, and (iii) caged birds are more prone to diseases and spread of the same compared to when they are housed in trees

Negative Farmer Experience and Perceptions

The study revealed that some farmers resist improved practices because of negative experiences. Farmers in Binga and Lupane (IDIs, FGDs) cited cases of hybrid seeds distributed under the Presidential Input Scheme not germinating. This failure discouraged them and other farmers from adopting hybrid seed varieties. In other cases, yields were low, reducing trust in improved seeds. Thus, farmers prefer to plant "trusted" retained seed just as their forefathers have done before them. One female farmer from Lupane emphatically conveyed: "I have already selected my (retained) seed and (it) has better germination than the hybrids/OPV." Some farmers who grow sorghum in Lupane noted that pests such as birds are a major challenge, and farmers who have experienced heavy losses have opted not to grow sorghum next season.

KIIs in Binga revealed that some farmers had developed negative perceptions towards vaccination mainly due to a lack of understanding how vaccines are used. Some farmers in Binga administered the Newcastle vaccine to infected chickens. The chickens died, and the farmers attributed the deaths to the vaccine.

High labor requirements also deter farmers from adopting recommended practices. For example, the sheer drudgery associated with conservation agriculture (potholing, applying manure and mulch, weeding) makes the approach unappealing to some farmers. The effect is more pronounced among elderly farmers and farmers living with a disability. The farmers indicated that due to the high labor demand they have not moved from conventional farming. Findings from IDIs revealed that some farmers who had taken up conservation agriculture under the *Intwasa/Pfumvudza* program had stopped. Beyond the plots needing "too much work," farmers reported a lack of manure and mulch.

Institutional Barriers

Farmers also face institutional barriers to adopting promoted practices. For example, improved varieties of maize and other crop seed are often unavailable on the market in Binga. All the farmers in Binga said that outside the Presidential Input Scheme and contract farming off-takers (for improved sorghum seed), improved seed varieties are not normally sold in Binga and farmers usually by form Hwange or Bulawayo. This situation has led some farmers to discontinue the use of improved seed. Livestock vaccines for diseases such as quarter evil must also be sourced from Bulawayo. This limited availability may stem, in part, from the lack of refrigeration capacity at local DVS offices (as one key informant noted, if DVS lacks refrigeration capacity, it is futile to expect resource-poor farmers to use vaccines "on their own").

Another hindrance reported by the farmers is related to the "lack" of adequate training on promoted practices. According to a farmer in Lupane, in the last couple of years, training by Agritex has concentrated on the *Pfumvudza/Intwasa* program, leaving a gap in understanding of other practices.

3.6 What might convince non-doers who have not adopted an improved behavior to do so? What are their top reasons for trying or not trying the behavior?

The study established several ways to motivate non-doers to adopt improved behaviors. Study participants in both Binga and Lupane identified training as a priority. According to some KIIs, training programs should engage local (traditional) leaders, as their participation will increase confidence in the training and "encourage attendance." The study participants also stressed that training should emphasize "practical activities" such as look-and-learn visits and demonstrations for all promoted behaviors. "If the farmers get demonstrations of the kind of kraals expected of them, they can then copy and construct their own, if local resources are all that is needed to construct the kraals," said a farmer in Lupane.

Farmers also said working in groups could motivate non-adopters to take up improved behaviors. IDIs in both districts point out that some farmers who have taken up the labor-intensive conservation agriculture practices have organized labor using a practice known as *ilima*.[42] Besides being sources of labor, groups (such as VSLs) can also help farmers mobilize funds to buy improved seed, fertilizer, and supplementary feed for livestock, among inputs. Encouraging farmers to form and or join "specialized" groups such as livestock production groups was also recommended. One key informant in Lupane said, "Farmers who are not vaccinating their livestock can be encouraged to take up vaccination for all animals by encouraging them to join groups or clubs that help them to learn from other farmers [and] share resources and skills."

[42] "Ilima" is a labor mobilization practice for tasks of a size or urgency that cannot be handled by one person or family unit.

Cost appears to be the main barrier to trying new practices. More than 95 percent of surveyed farmers said they cannot afford to buy vaccines for their livestock and depend on government and NGOs for "free" vaccines. Similarly, high costs prevent the use of commercial feed in supplementary feeding, reducing its benefit. Chicken feed, for example, is usually supplemented with grain (e.g., pearl millet, sorghum). Although this saves chickens from starvation, it does little to improve their overall health. And despite the promise of high yields and drought tolerance, improved seed are sold at prices beyond the reach of many farmers. According to a farmer from Lupane, a 25kg pack of maize seed costs approximately $90, which is more than most farmers can afford. As a result, farmers have few options beyond retained seed.

Perceptions and preferences also matter. Some farmers report using retained seed because they produce grains that are more palatable than hybrid and improved OPV varieties. For others, the use of retained seed emanates from their love for traditional varieties. "Yes, we retain seed, it is for all crops. We have learned this from practices passed down from our elders. We retain for seed security so that we can share with neighbors," said a farmer from Binga.

In other cases, cost and perceptions combine to form a barrier to adopting improved practices. For example, although farmers appreciate the usefulness of a crush, less than 10 percent of the surveyed farmers confirmed having the facility at their kraals, in part due to lack of resources. They also saw "no need to invest in the facility since crushes are available at the local dip-tanks." In addition, farmers said that they have always used ropes to handle cattle and goats for inspection, vaccination, and treatment and the practice has always worked for them.

3.6 For all the above questions, how do gender dynamics impact adoption vs. non-adoption? What strategies/ messaging are effective for males and females?

The study established that gender dynamics play a role in influencing the adoption (or non-adoption) of new behaviors depending on whether households are headed by women or men. In male-headed households, men decide which crops and seed to plant. In Binga, this domination does not extend to the actual work in the fields, with women doing most of the farming work. When using conservation agriculture, women dig basins while men stump and clear the land (one key informant in Binga reported that "men tend to avoid the digging of basins"). This separation of labor limits the uptake of new behavior—especially labor-intensive practices such as conservation agriculture—because women's household obligations limit how much time they can spend on agricultural production.

The picture in Lupane was mixed, with respondents suggesting the sharing of duties between men and women was more "equal." According to a key informant in Lupane, "women dig basins whilst men clear brush because they have more power than women." The key informant further pointed out that all other tasks are done by both husband and wife, with this cooperation resulting in increased uptake of promoted practices.

Another notable finding is that more women than men participate in training. This means that women are more likely to be exposed to learning by doing, which can drive the adoption of recommended practices. As such, training is a great way to reach female farmers. High rates of participation in training also help incubate social learning—another driver of adoption—among women.

The study also established that male farmers are more interested in large livestock (cattle) and, therefore, are more likely to adopt behaviors that help safeguard cattle.

4. Discussion and Recommendations

The study established shared motivations (economic and social) for both crop and livestock production in the two districts. It found only a weak connection between the benefits of a recommended practice and its adoption (the hypothesis being that farmers would naturally adopt practices that increase productivity). While the perceived benefits of a practice matter, they do not outweigh the drawback of high costs. For instance, despite offering high yields and drought resistance, hybrid and OPV seed varieties are not yet widely used due to their high cost. High costs similarly dissuade farmers from vaccinating their livestock against common diseases. As such, any effort to promote the uptake of recommended practices must be accompanied by efforts to address the high cost of implementation.

The study also revealed that farmers' attitude toward a practice greatly influences whether they will adopt said practice. These attitudes are shaped by experience (both the farmer's own and that of others). Both doers and non-doers say what they "saw" and "heard" about a practice influenced their attitude. For instance, reports that hybrid seed were "not germinating" dissuaded some farmers from planting regionally appropriate improved hybrid and OPV seed varieties and reinforced their belief that retained seed are more reliable than improved varieties.[43] This finding highlights the importance of building a good reputation for each recommended practice.

Institutional support is also important. Changing attitudes will have little impact if inputs are unavailable in local markets. In the absence of improved inputs, farmers will fall back on "old behaviors."

Considering these findings, the research team offers the following recommendations:

- More funding and engagement with breeders is needed to research and develop better-tasting small grains and higher yielding varieties that are more acceptable to the market. A starting point would be sharing this study's findings on preferred traits for high-yielding seeds with breeders.
- Development stakeholders should engage local agro-dealers and other private sector players to craft mutually beneficial seed distribution strategies. To ensure quick turnover of the seed, development partners can help farmers organize into groups that raise funds for the prepayment of seeds. These measures will help input suppliers avoid costly, unprofitable procurement trips, increase local availability, and, in the process, help cut costs for those farmers accessing the seed from Bulawayo. The development would also reduce the dependency on free inputs distributions.
- Farmers would benefit from guidance on developing local feed formulas in which nutritious shrubs, leaves, and twigs are ground together with stover to improve its nutritional composition. Training sessions and demonstrations on purchasing and adding nutritional supplements such as molasses to stover would also be beneficial. Also given that the farmers indicated that the stover is inadequate, farmers should be trained on targeted resilience-building supplementary feeding. This can be achieved by assisting farmers to prioritize supplements for breeding stock while, at the same time, encouraging farmers to dispose of non-productive animals. In addition, there is a need to produce more fodder crops as it is generally cheaper to produce compared to buying commercial feed. Demonstration plots can promote the uptake of fodder crops as a viable supplementary feed for livestock. Generally it is cheaper to produce feed compared to buying commercial feed.
- To address the barrier of costs, development partners should encourage farmers to form and join savings clubs and groups. These groups can strengthen the financial management capacity of

[43] This finding highlights the need to avail improved quality of retained seed through community-based seed multiplication models.

farmers while also helping inculcate banking behavior into the rural community more generally. When fully embraced, savings groups and clubs may help expose participants to formal financial institutions such as microfinance institutions and banks.

The following recommendations can help promote individual behavior change:

- Carefully target messages and media to individuals. Targeting requires a nuanced understanding of farmers and the environments in which they work. For instance, messages targeting farmers in Binga will differ from those targeting Lupane farmers, even when addressing the same practice or behavior. This tailoring is necessary because of differences in economic and socio-cultural dynamics such as level of education, age, and gender. Targeted messaging elicits better responses than blanket messages.
- Fund and promote ongoing knowledge and information exchange activities, such as face-to-face training and demonstrations. For training to be effective in changing behaviors, organizing training in accordance with the production calendar (KII in Binga). Connect training programs to local extension services as this approach will encourage farmers' participation and increase training effectiveness.
- Use demonstrations to build positive attitudes toward a recommended practice, demonstrate value, and ease of adoption. Unless farmers see the value in adopting a new behavior, they are unlikely to change their ways.
- Make a deliberate effort to incentivize behavior change, which research shows can result in positive change.[44] Ensure that rewards can be sustained and underpin financial rewards with other interventions. For example, consider engaging market players such as seed houses to host shows and field events where outstanding doers are recognized.

[44] Henning, S.A., Zhong, Y., Cardona, H.," Ecological attitudes of farmers and adoption of best management practices," Southwestern Economy. Proceed. 31 (2), 57–70, 2012

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