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Agribusiness Responses to Climate Risks: Implications for Improving Smallholder Resilience

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Acronyms

CSA	Climate Smart Agriculture
CDTF	Cotton Development Trust Fund - Tanzania
COMPACI	Competitive African Cotton Initiative
CRIDF	Climate Resilience Infrastructure Development Facility
DFID	Department for International Development - UK
FAO	Food and Agricultural Organisation of the United Nations
FOREX	Foreign exchange market
GHG	Greenhouse gas emissions
GPS	Global positioning system
IFC	International Finance Corporation
IPCC	The Intergovernmental Panel on Climate Change
NGO	Non-governmental organisation
R&D	Research and development
SSA	Sub-Saharan Africa
TFP	Total Factor Productivity
UTZ	Universal Trade Zone

Executive Summary

This study examines whether agribusiness firms are helping to improve the climate resilience of the smallholder farmers with whom they work. After reviewing the relevant literature, the study analyses case studies in three countries with relatively larger agribusiness sectors: Tanzania, Zambia, and Zimbabwe.

Eastern and Southern Africa have been experiencing rising temperatures and high levels of rainfall variability. There is a significant amount of uncertainty in the literature on whether some of these climate risks, such as changes in precipitation, are caused by natural factors or by rising levels of greenhouse gas (GHG) emissions. What is clear, however, is that climate risks are profoundly affecting the agricultural sector. Small-scale farmers face food insecurity, price volatility, and reduced incentives to expand their production of high-value commercial crops. Similarly, the agribusinesses anchoring these value chains face higher investment and trading risks. Experts believe that the resilience of the sector needs to be strengthened.

The literature on agribusiness responses to climate risks is limited, especially with regard to case studies. The available literature suggests that agribusinesses that have their own farms often implement production responses as part of normal risk management or production enhancement processes. In addition, agribusinesses have to contend with a number of risks in the Sub-Saharan (SSA) context. Firms may not be willing to invest in smallholders when faced with risks such as side-selling since a return on investment may not be realised. Agribusinesses are therefore more likely to change their business strategies, such as diversifying products and making supply chain adjustments, in response to climate risks.

In the absence of existing case studies, a field survey was undertaken. The survey principally targeted 13 agribusinesses operating in relatively dry regions, where climate risks are already significant. Three specific types of value chains were selected for review: cotton, sunflower, and pulses (such as chickpea, cowpea, and pigeonpea). This was complemented by a sample of five agribusinesses located in higher-rainfall zones where climate risks may become costly in the future. These five businesses process and market coffee or tea. Interviews examined whether companies in these less-risky environments are already adapting, or planning to adapt, their production and trade strategies in response to climate risks.

The field study revealed that most agribusinesses are worried about a rise in temperatures and increases in the variability of seasonal rainfall. Some believe that factors

such as increasing temperatures may be contributing to a rise in pests and diseases. They tend to consider climate risks as very important to their businesses whilst other business risks, such as side-selling, loan defaults by smallholders, and limited access to financial resources feature prominently. In addition, a number of firms cited government policy and market prices as key risks.

“  **Most agribusiness are worried about a rise in temperatures and an increase in the variability of rainfall.**

In terms of improving the resilience of smallholders, the cases studies reveal the following:

- In dry areas, none of the companies are investing significantly in smallholder resilience. Where interventions are made directly by these agribusinesses, these are generally limited to activities such as soil moisture testing, crop monitoring, and supplying seed to enable timely planting. Seven companies have donor and non-governmental organisation (NGO) programmes that support smallholders. Some of these publicly funded programmes help smallholders respond to climate risks.
- In higher-rainfall areas, companies that have their own farms are generally making limited investments in outgrowers, and more significant investments in their own farms. Investments in outgrowers are generally centred on training for smallholders in practices such as mulching and pruning.



- Agribusinesses are more likely to respond to climate risks by expanding their catchment areas, importing raw materials, or diversifying their products, rather than investing in improving the resilience of smallholder production systems.
- Only a few very large companies are willing to invest in the dissemination of new seed varieties or planting stock for outgrowers.
- Although most of the agribusinesses are aware of the future climate risks that they may face, none articulated internal business strategies that are aimed at improving smallholder resilience over the long term.
- Many of the companies believe that governments and donors should play a primary role in building the climate resilience of small-scale farmers.

Agribusinesses face constraints such as access to finance, unpredictable markets due to government intervention and price volatility. In addition to these risks, companies commonly cite the risks of side-selling as constraints for investing in improving the resilience of smallholders, particularly in drier regions. Many of these companies benefit from donor and/or NGO support to improve the productivity of their smallholders. Such programmes provide assistance with input credit support, training

in crop diversification, minimum tillage practices, and pest management. However, agribusinesses expressed concern that when donor funding ends, smallholders are not able to afford the proposed technologies. This raises concerns about programme sustainability.

Agribusinesses were more likely to assist their outgrowers in higher-rainfall zones. Several companies provided training in mulching and pruning, as well as in improved planting materials. This is probably a result of lower risks of side-selling and more limited options for the expansion of catchment areas.

Although agribusinesses are not investing significantly in smallholder resilience, these firms play an important role in anchoring value chains, linking farmers to markets, assuring quality control, and helping with logistics. The Vuna programme takes account of the commercial role of agribusinesses within value chains. Programmes need to be designed according to the different roles that stakeholders can play in building the climate resilience of value chains. These agribusinesses appreciate publicly funded assistance. However, the sustainability of these investments needs to be carefully evaluated. This study recommends models that encourage public/private partnerships and co-funding arrangements to ensure programme sustainability.





Climate risks are not a new phenomenon in Eastern and Southern Africa, and they have significant impacts on the expansion of agricultural value chains.



1 Introduction

1.1 Background

Climate risks are not a new phenomenon in Eastern and Southern Africa, and they have significant impacts on the expansion of agricultural value chains. These risks are most obvious in drought-prone environments where low and variable rainfall increases the variability of commodity production and supply, reducing profitability. These risks reduce incentives to invest in improved agricultural inputs. Risk-averse farmers are less willing to adopt new technologies. The variable supply of commodity in the market makes it difficult to optimise trade and processing infrastructure and lowers the profitability of these operations.

Nevertheless, many agribusinesses routinely pursue trading and processing investments in drier and relatively more drought-prone environments. These involve a range of commercial crops that have a comparative advantage in drier agro-ecologies and that are grown by smallholders in Eastern and Southern Africa namely: cotton, sunflower, sesame, chickpea, and pigeonpea.

Climate trends are likely to increase climate risks. Rising temperatures will reduce the productivity of heat-sensitive crop varieties. The combination of rising temperatures and high humidity can increase the populations of insect pests and the incidence of plant diseases. Variable rainfall leads to greater uncertainty about production levels, and a higher risk of not obtaining enough crops to assure the profitability of trade infrastructure and processing plants.

Many agribusinesses in higher-potential zones are also starting to worry about weather risks. Temperatures are already rising in much of Eastern and Southern Africa. In some areas, rainfall appears more variable, and the risks of drought are reported to be rising. Agribusinesses are commonly aware of these rising climate risks. However, it is less clear how firms in zones that have historically received higher and more consistent rainfall may be preparing for climate change.

The Food and Agricultural Organisation of the United Nations (FAO) believes that “future land use and food security will be determined largely by the dynamics and interactions of agricultural markets, climatic suitability, adaptive capacity, and direct interventions along the supply chain.”¹ When endeavouring to improve the climate resilience of smallholders, it is therefore important to examine the responses of agribusinesses to climate risks.

1.2 Purpose of the study

The Vuna programme aims to improve the climate resilience of smallholder farmers by pursuing a holistic approach to promoting the adoption of climate smart agricultural practices. A key element of this strategy is the promotion of climate smart investments within well-functioning value chains.

The purpose of this study is to identify how agribusiness firms in organised production and trading relationships with smallholder farmers respond to climate risks, and how they may invest in improving the climate resilience of smallholders within value chains for selected commercial crops.

1.3 Methodology

This study comprised two key components: a literature review and a field survey.

The literature on agribusiness responses to climate risks is limited. Moreover, there are no relevant case studies that have sufficient information on how agribusinesses may be improving smallholder resilience in Africa. Therefore, a field survey was designed in order to collect information from a sample of agribusinesses across three countries in Eastern and Southern Africa.

The field survey was carried out in Tanzania, Zambia, and Zimbabwe. It was implemented with the primary aim of inventorying efforts to offset climate risks being made by agribusinesses purchasing crops grown in drought-prone regions. The survey examined efforts to promote the use of technologies that withstand, or offset, weather risks, such as drought-tolerant seed varieties and strategies for better water management. The survey also considered how

¹ FAO (2015), p. 2.

agribusinesses use trading strategies to offset climate risks, including the diversification of commodities purchased or the expansion of contracting and purchase areas to cover better or more diverse production environments.

The survey also examined how agribusiness operating in higher-rainfall zones are adjusting their operations in order to cope with the prospect of climate risks. This component asked whether these companies were starting to invest in more climate-resilient technologies, shifting their commodity focus, or considering the relocation of their operations to less affected regions.

In each case, the survey assessed the relative priority agribusinesses attach to climate in comparison with the many other business risks they face. The survey also evaluated the degree to which climate risks are internalised by the firm, rather than left in the hands of the farmer.

The main sample targeting drought-prone environments examined how agribusinesses contracting smallholders for cotton, sunflower, and pulses dealt with weather risks. These value chains are known to be relatively developed.² The study included a review of these firms' perceptions of weather and climate risks: what types of weather risk are most severe, the consequences of these risks, and how significant these problems are relative to the broader range of market and policy risks faced. The survey then inventoried what investment strategies are being pursued to offset these weather risks. This included consideration of changes in cropping technologies (such as seed varieties and soil and water management), adjustments in the configuration of the supply chain (promotion of diversification or breadth of area coverage), adjustments in contracting arrangements (such as credit terms, buying terms, and contract specification), adjustments in trading and processing operations (commodity storage strategies, processing capacity, and processing technology), and the use of insurance.

A smaller complementary sample was undertaken to target agribusinesses with supply chains encompassing smallholder farmers growing coffee and tea in higher-rainfall zones. These value chains are relatively well developed, especially in Zimbabwe and Tanzania.³ This sample examined the extent to which these firms are worried about the impacts of climate risks, and how they are responding to these risks. The primary emphasis was on assessing the impacts of rising temperatures on variety choice, water management strategies, and rising insect pest and disease pressures. Again, this survey evaluated how these agribusiness firms view the relative importance of climate risks compared with other market and policy risks, and inventoried specific investments being made to respond to these risks.

The types of companies in the two samples include agro-processors, commodity trading companies, cotton ginners, and exporters. The sample selection is not based on structured or random sampling, due to the lack of information in these countries. Although the sample is not entirely representative of all agribusinesses in these countries, the agribusinesses selected are well-known and established companies. The aim was to obtain a set of case studies that will provide a snapshot of agribusiness strategies and responses.

A questionnaire was designed for the interviews (see Annex 2). The questions are based on the literature review. A pre-test of the questionnaire involving two larger agribusinesses was undertaken and adjustments to the questionnaire were made.

Section 2 of the report provides a brief overview of literature on agribusiness responses to climate risks. This includes a discussion on the risks facing agribusinesses, the range of responses to climate risks, and the hypotheses for the study. Section 3 provides an overview of the field survey results (a more detailed write-up of the interview results is contained in Annex 1). Section 4 summarises the major findings of the study and makes recommendations for future action.

2 For example, see Tschirley and Kabwe (2009) on the cotton sector in Zambia.

3 For example, see Baffes (2005) on the Tanzanian coffee sector.

2 Literature review

2.1 Agricultural risks

2.1.1 Climate Risks in Eastern and Southern Africa

African food production systems are amongst the world’s most vulnerable to climate risks due to their reliance on rain-fed crop production. The latest reports from the Intergovernmental Panel on Climate Change (IPCC) summarise the status of current climate risks, and predicts how these risks are expected to change between now and the end of the century.⁴

The IPCC presents evidence of an increase in mean annual temperatures over most parts of Africa over the past century, as shown in Figure 1.

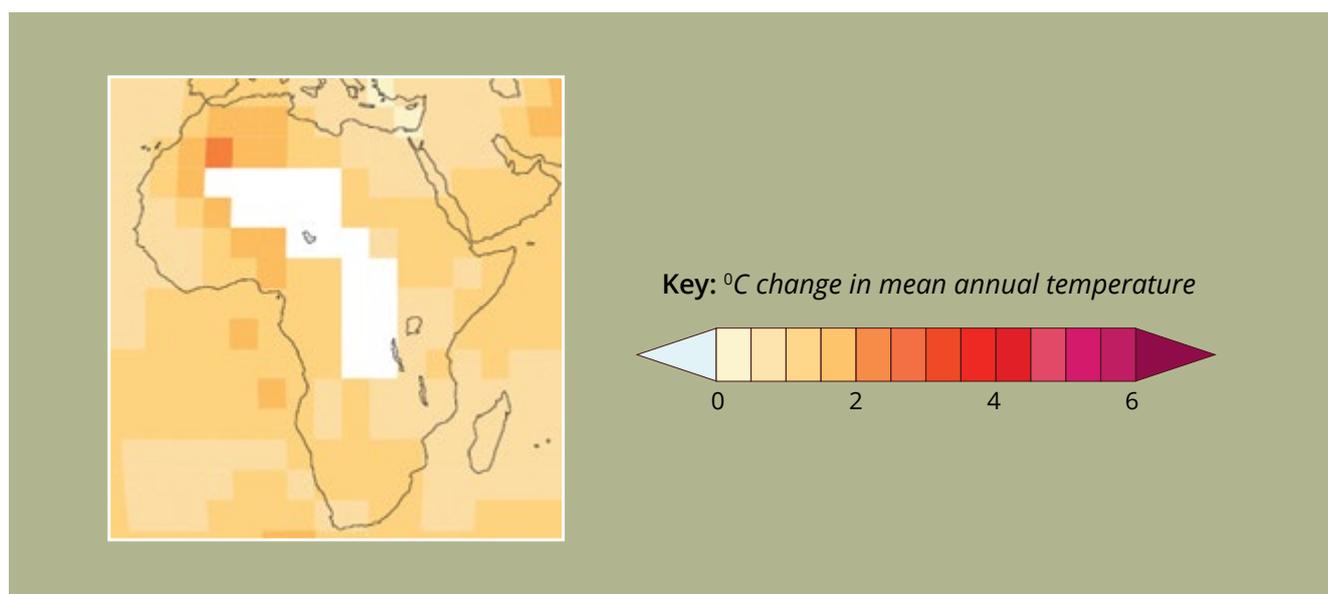


Figure 1: Mean annual temperature change over Africa, trend 1901-2012
 Source: IPCC Fifth Assessment Report (Working Group 1). Areas in white denote regions that have insufficient data.⁵

Temperatures have increased by as much as 1.5 degrees Celsius in the eastern parts of Eastern Africa and in Southern Africa. These changes are closely associated with the rise in global emissions of GHG.

The IPCC reports that over the past three decades’ rainfall has decreased over many parts of Eastern Africa between March and June of each year. In addition, over the past 30–60 years the number of extreme events such as droughts and heavy rainfall have increased. Late-summer precipitation decreased over the western regions of Southern Africa during the second half of the 20th century. There have also been changes in the timing of the onset of rainfall, its duration, dry periods, and rainfall intensity. However, it is unclear whether these changes are a result of natural causes or climate change. The recent severe drought in Southern Africa is believed to have been caused by the El Niño phenomenon (which is linked to changing sea surface temperatures rather than to GHG). Extreme events such as droughts and floods may increase in the future.

Warming in the highland regions of Eastern Africa could lead to the range expansion of crop pests. Climatic factors may also affect the distribution of economically important pests in lowland and dryland areas of Africa. The coffee berry borer is becoming a serious threat in the coffee-growing regions of Eastern Africa. The south-eastern parts of Africa and Madagascar are reported to experience increased suitability for cassava pests.

4 IPCC (2014a).
 5 IPCC (2014b), p. 1207.

2.1.2 Studies on crop impacts

The IPCC cites possible impacts of climate risks on crop yields. These estimates do not take the adoption of changes in crop varieties or management practices into account, nor do they generally consider the positive effects of rising levels of carbon dioxide on plant growth. Nevertheless, the IPCC report does provide a sense of the magnitude of the possible losses in yields if no countervailing actions are taken:⁶

- An overall potential negative effect on the yields of major cereal crops, with likely regional variability. By 2050, maize output, particularly in Southern Africa, may suffer the highest yield reductions (more than 30% in Zimbabwe and South Africa). A 2% loss in sorghum and a 35% reduction in wheat yield is projected.⁷
- There may also be variable impacts on non-cereal crops. Yields in beans in Eastern Africa are estimated to experience reductions. Bambara groundnuts could benefit from moderate climate change, but this will vary across varieties. Banana and plantain production could decline in West Africa and the Eastern African lowlands, but increase in the highlands of Eastern Africa as temperatures rise.
- Suitable agro-climatic zones for growing perennial crops are predicted to significantly decline, largely as a result of the effects of rising temperatures. For example, coffee and tea suitability could decrease in higher altitudes in Eastern African countries such as Kenya, although those crops may become more suitable for growth in low altitudes. Cotton suitability may decrease in countries such as Ghana and Côte d'Ivoire.

The World Bank projects that around 3% of Africa's agricultural land may switch from mixed livestock-crop systems to livestock systems by 2050.⁸ The impact of climate risks on agricultural output has economic and social consequences.⁹ Poverty limits the capacity to adapt.¹⁰ Small-scale farmers, especially women, are particularly impacted by reductions in staple foods, price volatility, and the loss of productivity of high-value commercial crops. Furthermore, the sector has to contend with a number of non-climate risks that may affect the ability to cope with climate risks.

2.1.3 Non-climate risks

Both agribusinesses and small-scale farmers are facing non-climate risks at the business, market, and regulatory/policy levels. Constraints to agricultural development in Africa can be placed into four categories, according to the World Bank:¹¹

- Erratic policies in agricultural output and input markets and trade
- Limited access to land and respect for community land rights
- Poor infrastructure and high transportation costs
- Difficulties in accessing finance, technology, skills, and information

In addition, total factor productivity (TFP) in Sub-Saharan Africa (SSA) is lagging in comparison to other regions of the world. Productivity of land, labour, and capital has grown at only about 1% per annum since the 1990s. The above constraints, often combined with a lack of effective technical skills development and extension support, play a major part in TFP.¹²

The World Bank reported that agribusinesses often face the following risks in SSA:¹³

- Production risks: This includes risks caused by erratic climate events causing yield volatility and damage to crops. Dysfunctional input markets also affect production.
- Market and price risks: These risks include side-selling, counterparty payment risks, and input and crop-price volatility.
- Enabling environment risks: These risks include public policy and regulations, such as changes to marketing-system regulations and price interventions that cause disruptions in input markets. Further risks include a lack of effective trade policies and the high costs of doing business, as influenced by taxes and other factors.¹⁴

6 Ibid.

7 Ibid., p. 1218.

8 Choudhury (2015), p. xi.

9 Oxfam (2016).

10 IPCC (2014b).

11 World Bank (2013a), p. 5.

12 Deutsche Bank Research (2014).

13 World Bank (2013b).

14 See Antonaci et al. (2014) on trade policies.

Larger agribusinesses such as traders may be able to hedge price risks, but the majority of farmers, traders, and cooperatives remain highly exposed. All actors along value chains are impacted by variations in yields and production. In many parts of SSA, market risks are compounded by climate risks such as variability in rainfall, production, and prices. Climate risks in distant markets can also affect farmers in SSA. For example, a drought in Russia can affect prices in Dar es Salaam.

2.2 Adaptation and resilience to climate risks

Climate smart agriculture (CSA) has three pillars, as detailed by FAO: “(1) sustainably increasing agricultural productivity and incomes; (2) adapting and building resilience to climate change; and (3) reducing and/or removing greenhouse gas emissions, where possible.”¹⁵ The Vuna programme is primarily concerned with the adaptation and resilience of small-scale farmers.

Adaptation is “an adjustment in natural or human systems in response to actual or anticipated climatic stimuli or their effects, which moderates harm or exploits opportunities to cope with the consequences.”¹⁶

Resilience is defined as “the capacity of systems, communities, households, or individuals to prevent, mitigate, or cope with risk and recover from shocks.”¹⁷ Capacity is the central consideration in terms of resilience. Systems that are resilient to extreme climate events are less likely to have highly vulnerable communities within them. Resilient systems also provide a solid base for promoting adaptive processes such as information, knowledge, and technologies.¹⁸

There are relatively few studies that assess both the adoption rates and effectiveness of agribusiness response strategies to climate risks in any region,¹⁹ and this is true of SSA as well.²⁰ A literature search undertaken for this study yielded only generic examples of sustainable agricultural practices.²¹ The theory suggests that there are a range of responses.

2.2.1 Production responses

Howden and colleagues argue that responses are often made within the production environment amongst firms that have their own farms. These are management-level adaptations that are generally an extension of existing climate-risk management or production-enhancement activities.

The following are examples of production responses to climate risks:

- Altering inputs. This includes using new seed varieties (that have heat and drought resistance) and altering fertiliser rates and water usage.
- Water harvesting, water transport, and soil moisture conservation technologies.
- Managing water to prevent waterlogging, erosion, and nutrient leaching.
- Alterations to the timing or location of crop activities.
- Diversifying the farm revenue base through activities such as livestock farming.
- Improving pest, disease, and weed management practices, including the use of pesticides, disease-resistant species, and quarantine and monitoring programmes.
- Using climate forecasting to reduce risks to production.²²

Other responses include improving pest- and disease-monitoring capacity and weather insurance. Gollin offers a scientific analysis of different technologies that are used to manage climate risks.²³

15 FAO (2013), p. ix.

16 Mapfuma et al. (2014), p. 11. This is the IPCC definition.

17 FAO (2013), p. 19.

18 Mapfuma et al., p. 12.

19 Howden et al. (2007).

20 Mapfuma et al.

21 See Taurayi (2011) for an interesting overview of how ZZZ has adopted “natural farming” as a sustainable farming practice.

22 See Haigh et al. (2015) for further information on weather forecasting in the U.S. cornbelt.

23 Gollin (2016).

Lobell argues that when models are used to measure adaptation to climate risks, scientific studies are often inaccurate since changing variables such as weather patterns over time are often not incorporated into the models; for this reason, scientific studies need to be clear about the baseline and the assumptions used in the models.²⁴

Nevertheless, Howden and colleagues point out that there are many options available to agribusinesses to respond to climate risks. Production responses in the absence of changes in the decision environment can result in substantial benefits under moderate changes in climate, although there are limits to the effectiveness of these changes under more severe climate events. They maintain that “the increasing scale of potential climate impacts give urgency to addressing agricultural adaptation more coherently.”²⁵ Effective responses will require changes in the decision environment, including the following:

- More systemic changes in resource allocations, such as new investments in technical and management strategies and diversification of production systems.
- Integration of climate change issues with other risk factors such as market risk.
- Integration with policy domains such as sustainable development. Policy options include developing infrastructure, altering land-tenure arrangements, creating efficient markets, and capacity-building.

Coherent response to severe climate risks often requires changes in the decision environment at both firm and policy levels. This includes a policy environment that facilitates access to technologies, infrastructure, and resources. Howden and colleagues acknowledge that there are formidable barriers to changes in the decision environment.

The extent to which agribusinesses face commercial risks may also impact how these businesses respond and invest in outgrowers.

2.2.2 Risks to agribusiness investments in outgrowers

Business risks can have a significant impact on a firm’s propensity to invest in helping smallholders improve their resilience to climate risks.

The International Finance Corporation (IFC) reported that one of the greatest risks for agribusinesses buying commodities from smallholder farmers is the failure to recover the cost of their investment, since farmers often side-sell some or most of their crops to other buyers to achieve higher prices. Investments - whether in the form of advanced payments to small-scale farmers or investments in productive capacity and technologies - becomes riskier when side-selling takes place. For example, in the Tanzanian cotton sector, the World Bank reported that price risk is mainly borne by ginners. When prices fall, side-selling takes place, especially when higher margins can be realised and when there are payment risks. The risk of side-selling also increases when farmers live on subsistence incomes.²⁶

Other risks faced by firms that can impact investments in smallholders include the risk that small-scale farmers don’t adopt new production practices, access to finance, high interest rates, and the impact of price volatility on margins.²⁷

2.2.3 Potential trade strategy responses

There are also various trade strategy responses that agribusiness can adopt in response to climate risks.

The World Bank study in Tanzania found that traders and agro-processors in the cotton sector responded to climate risks through product diversification, price bargaining, and stockpiling of inventory to cope with decreases in supply.²⁸ Other trade strategies include broadening the catchment area, importing products, and sourcing alternative products in the event of a decrease in crop production or side-selling. Larger companies may also adopt hedging strategies.

²⁴ Lobell (2014).

²⁵ Howden et al. (2007), p. 19691.

²⁶ World Bank (2013b).

²⁷ IFC (2013).

²⁸ World Bank (2013b).

2.2.4 Agribusiness responses to climate risks

A summary of production, trade, and investment responses to climate risk is provided in Table 1 below. This highlights the diversity of potential responses available to agribusinesses.

Table 1: Range of Possible Responses to Climate Risks

Type of risk	Production responses	Business and trade strategy responses
Increases in temperature	<ul style="list-style-type: none"> Altering seed varieties (e.g., heat-resistant traits) Alterations to the timing or location of crop activities Soil moisture conservation Water management 	<ul style="list-style-type: none"> Crop diversification Crop insurance Diversifying the farming revenue base Investment in R&D
Changes in rainfall patterns, intensity (e.g., storms, hail), timing, and seasons	<ul style="list-style-type: none"> Alterations to the timing or location of crop activities Crop diversification Soil moisture conservation Intercropping Crop shelter interventions (e.g., tunnels and netting) 	<ul style="list-style-type: none"> Delayed payments to farmers Hedging in the case of exporters and traders Sourcing crops from other producers or other areas in the case of nucleus farms, traders and processors Stockpiling in the case of traders and processors
Changing crop seasons (delayed start, early end)	<ul style="list-style-type: none"> Crop diversification Alterations to the timing or location of crop activities 	<ul style="list-style-type: none"> Altering trading strategies such as importing in the case of traders and processors
Changes in pest and disease pressures	<ul style="list-style-type: none"> Altering seed varieties (e.g., disease-resistant traits) Use of pesticides On-farm agronomic practices Early warning systems Integrated pest management (IPM) Improved phytosanitary systems Quarantine and monitoring programmes 	<ul style="list-style-type: none"> Price negotiations Use of climate forecasting and improved monitoring
Droughts	<ul style="list-style-type: none"> Altering seed varieties (e.g., drought-resistant traits) Crop diversification Water harvesting and irrigation control Improving early warning systems Reforestation/afforestation to manage soil erosion Contour farming, soil and water conservation programs, land and water management Agronomic practices for on-farm drought management Crop diversification 	
Flooding	<ul style="list-style-type: none"> Improving early warning systems Land alterations (e.g., relocation of fields to higher ground) Water run-off management Soil erosion management Contour farming Water erosion management, including reforestation/afforestation 	

Source: Howden et al. (2007), World Bank (2013).

The responses to climate risks may vary depending on what type of risks are being faced by which type of agribusiness. Agro-processing and trading companies may respond by adjusting their trade strategies. Agribusinesses that have their own farms, combined with sourcing from smallholders, may adjust both their trade strategies and their production responses within their internal operations. Where agribusinesses do invest in small-scale outgrowers, such investments may be limited to providing the lowest-cost solutions such as the dissemination of different seed varieties as opposed to investing in expensive technology.

2.3 Hypotheses

Based on the literature review, five hypotheses were formulated to guide the survey plan and analysis:

- **Hypothesis 1:** Agribusinesses commonly view climate risks as less important than the many non-climate risks that they need to contend with in Eastern and Southern Africa.
- **Hypothesis 2:** Agribusinesses do not invest in smallholders if they are not sure that they will realise the benefits of such investments. If agribusinesses do invest, then such investments will be small (promoting the dissemination of improved seeds, for example) rather than significant (investments in water technology, for example).
- **Hypothesis 3:** Agribusinesses primarily respond to production shortfalls by adjusting their business and trade strategies as opposed to investing significantly in small-scale farmers. Such adjustments may include broadening their catchment area for obtaining crops, diversifying products, or even importing.
- **Hypothesis 4:** When faced with climate risks such as drought, agribusinesses that have their own farms - in addition to sourcing from outgrowers - may make adjustments to their crop management strategies (such as the adoption of new seed varieties, planting strategies, and water management) rather than investing significantly in outgrowers.
- **Hypothesis 5:** Most agribusinesses are not fully aware of the climate risks that they face in the medium term, over the next 20 to 40 years. Those that are aware of these risks do not have explicit strategies for responding because they are concentrating on more immediate business risks.

The alternative hypotheses are that current and future climate risks are often well understood by agribusinesses and that these companies are contributing significantly to building the resilience of smallholder operations within value chains.

2.4 Conclusion

Agribusinesses that have their own farms often implement production responses as part of normal risk management or production enhancement processes. However, these responses may not be effective when severe climate risks occur. Changes in the “decision environment” at firm and policy levels may be important determinants in the coherence of response strategies. In addition, agribusinesses may not be willing to invest in smallholders when faced with risks such as side-selling. As a result, their responses tend to involve changes to business and trade strategies. In the absence of existing case studies, a field survey has been undertaken to test the responses of agribusinesses. The results of the field survey are provided in the next section.



3 Field survey results

Interviews were conducted with 18 agribusinesses in Tanzania, Zambia, and Zimbabwe. Of those companies, 13 are involved in cotton, pulses, and sunflower grown mainly in dry areas,²⁹ and five work in the tea and coffee sectors in higher-rainfall areas. The companies included agro-processers, commodity traders, cotton ginners, and exporters.

Some of the tea production companies combine production from their own plantations with outgrower programmes. One oilseed company in Tanzania also has its own plantations. The remaining companies all source crops from small-scale farmers. The sizes of the agribusinesses range from 5 to 5,000 employees, except for one that has 24,000 employees. Company names are not reported in order to maintain confidentiality.

3.1 Interviews with agribusinesses

Table 2, below, summarises the interviews in more detail. For a detailed report on each interview undertaken, see Annex 1.

Table 2: Field survey interview results

Type of rainfall area	Company	Country	Crops, area, and climate risks	Investment in smallholder resilience	External support	Investment in own farms	Business strategy, supply-chain response	Risks and issues affecting support for smallholders
Dry Areas	Case # 1 Commodity trading and edible oil Size: 60 staff 30,000 farmers	Zambia	Sunflower sourced nationally Variable rainfall, including drought in southern Zambia	None	None	Not applicable (N/A)	<ul style="list-style-type: none"> Use of 12-month forecasts Use of inventory to manage volatility Expansion of catchment area Company diversifying product portfolio 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Climate Government intervention in maize pricing Need to encourage drought-resistant crops and avoid intervention in maize prices, as this affects sunflower sector
Dry Areas	Case # 2 Commodity trading, input supply, and cotton ginning Size: 250 staff, 2,400 at peak 100,000 outgrowers	Zambia	Cotton and cowpea sourced nationally Variable rainfall (past 2 years); southern region more severely affected	No direct production interventions (weather index insurance facilitated)	NGO support Weather index insurance supported by NGO	N/A	<ul style="list-style-type: none"> Expansion into other catchment areas 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Prices and FOREX volatility Climate risks Side-selling, FOREX volatility, and expensive hedging instruments Donor support programme is coming to an end
Dry Areas	Case # 3 Commodity trading and input supply Size: 20 staff Unknown number of farmers	Zambia	Sunflower sourced nationally Delay in rains and drought in some areas (last season). Increase in lava	None (interventions are externally supported)	Government and NGO supported Spraying programme and crop diversification programme externally supported	N/A	<ul style="list-style-type: none"> Extensive catchment area and imports 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Climate Trading risks, side-selling, and government intervention in maize affects cash flows Need for irrigation

²⁹ Note that some of the perennial crops that are sourced, such as pulses, may also be grown in areas that can receive higher rainfall. This is particularly the case for large commodity trading companies that have extensive catchment areas.

Type of rainfall area	Company	Country	Crops, area, and climate risks	Investment in smallholder resilience	External support	Investment in own farms	Business strategy, supply-chain response	Risks and issues affecting support for smallholders
Dry Areas	Case # 4: Cotton ginnery Size: 180 staff, 1,000 at peak 23,558 farmers	Tanzania	Cotton in the Mwanza area Variable rainfall (dry and heavy rainfall areas), delayed season, increase in borer worm	Timely supply of inputs, minimum till practices, and spraying	Extension services are NGO supported	N/A	• Expansion of catchment area	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Climate • Low quality, low output, low prices, and side-selling • Access to quality seeds, education for farmers, and minimum tillage practices
Dry Areas	Case # 5 Cotton ginnery Size: 113 staff, 1,600 at peak 40,000 farmers	Zambia	Cotton seed sourced nationally Variable rainfall, delayed seasons, temperature increases, and borer worms (due to heat)	No changes beyond input supply and training Monitoring of germination, scaling back inputs	Training support from NGO; pest-management support from donor (trial molasses traps)	N/A	• The firm relies on an extensive catchment area	<ul style="list-style-type: none"> • <i>Highest risks:</i> Price and climate • Low germination levels, bad debts, and sustainability of donor programmes • Drip irrigation technology needed • The donor pest management programme was tested for one season and has now ended; farmers cannot afford intervention
Dry Areas	Case # 6 Cotton ginnery Size: 75,000 metric tonnes/ annum 46,000 farmers	Zambia	Cotton seed sourced nationally Variable rainfall, changes in timing of seasons, spider mites (due to heat)	No changes beyond normal training provided	None	N/A	• Crops sourced from all parts of the country	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Product prices • Climate risks rank third • Side-selling, interest rates, and cost of transport • Farming productivity needs to be increased • Government and NGOs need to improve extension support
Dry Areas	Case # 7: Cotton processor, oil and animal feed Size: 300 to 400 at peak 14,000 farmers	Tanzania	Cotton seed in the Kahama area Increase in temperatures and variable rainfall	None other than the timely supply of seed on credit	Seed provided to farmers through support from CDFT	N/A	• Shifted catchment area to source sunflower	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Inconsistent commodity supply • Climate risks rank fifth • Low output, loan recovery risks, and cash-flow constraints • Access to quality seed and lower interest rates needed

Type of rainfall area	Company	Country	Crops, area, and climate risks	Investment in smallholder resilience	External support	Investment in own farms	Business strategy, supply-chain response	Risks and issues affecting support for smallholders
Dry Areas	Case # 8 Cotton and soya processor, soaps and edible oil Size: 300 staff 200 farmers	Zimbabwe	Cotton and soya in the Bulawayo area Erratic rainfall, (especially last season); late rains and hail storms	No direct interventions Normal training and seed provided on credit	NGO support for training Replanting after hail encouraged	N/A	<ul style="list-style-type: none"> Imports of crude Oilseed diversification 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Business costs Climate risks rank third Government policies, side-selling, and high interest rates Company sources from farmers that are part of irrigation scheme
Dry Areas	Case # 9: Exporter Size: 160 staff 300 farmers/crop	Tanzania	Pigeonpea and sunflower sourced nationally Temperature increases and unpredictable rainfall (excess rain last season)	None	No external support	N/A	<ul style="list-style-type: none"> Extensive catchment area Purchasing scaled back and export contracts limited to deal with quality problems 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Security due to cash business Climate risks rank second Company is a trader; risks are not a factor Need for cooperative farmer societies Government reports on production to enable business planning
Dry Areas	Case # 10 Exporter, input supplier and food processor Size: \$5 billion in sales Number of farmers: unknown	Zambia	Cowpea and pigeonpea sourced nationally Delayed rainfall and shortened crop seasons	None Soil moisture testing and information provision only General input supply and some agronomy support	No external support	N/A	<ul style="list-style-type: none"> Extensive catchment area and imports if necessary 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Climate The company is a trader so risks do not have an impact Farmers need to diversify their crops (e.g., soya is more profitable than maize) Weather forecasting is important
Dry Areas	Case # 11 Sunflower oil Size: 22 staff, 40 at peak 1,200 farmers	Tanzania	Sunflower seeds in the Singida region Drought (two seasons ago)	None	No external support	Investment in new implements (e.g., deep ploughing)	<ul style="list-style-type: none"> Diversification of product portfolio Import of crude oil for refining 	<ul style="list-style-type: none"> <i>No. 1 risks:</i> Climate Climate risks, profits, and cash flow affect the ability to support smallholders
Dry Areas	Case # 12 Sunflower oil Size: 350 staff Number of farmers: unknown	Zambia	Cotton seed, soya, and sunflower sourced nationally Drought in certain areas	None	No external support	N/A	<ul style="list-style-type: none"> Imports of crude oil Crushing of other seeds 	<ul style="list-style-type: none"> <i>No. 1 risk:</i> Competition Climate risks rank third Competition affects volumes sourced Supportive institutions are needed A formal outgrower programme is needed within the company

Type of rainfall area	Company	Country	Crops, area, and climate risks	Investment in smallholder resilience	External support	Investment in own farms	Business strategy, supply-chain response	Risks and issues affecting support for smallholders
Dry Areas	<p>Case # 13 Sunflower oil and consumer retailer Size: 6 staff 500 farmers</p>	Zimbabwe	<p>Sunflower seeds in the Mutoko area Variable rainfall: higher-rainfall area has now become dry; late start to seasons</p>	None	NGOs provide training and crop diversification advice in the area	N/A	• None	<ul style="list-style-type: none"> • <i>No. 1 risks:</i> Side-selling and climate • Side-selling, access to finance, and low market prices • Water infrastructure, including dams and irrigation • Seed has low oil content due to the use of hybrid seeds from harvest for planting; access to seed is important
Higher-rainfall areas	<p>Case # 14: Industrial conglomerate and agro-processor Size: 24,000 staff Number of farmers: unknown</p>	Tanzania	<p>Tea Increases in temperatures, variable rainfall, dry perennial rivers, and falling water table</p>	None	None	<p>Use of borehole water Investment in new planting stock on own estates</p>	• Extensive catchment area and imports	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Competition from imports • Climate risks rank second • Side-selling, financing and low financial performance • Irrigation projects, access to seeds, and linkages between farmers and agro-processors • Climate smart farming practices
Higher-rainfall areas	<p>Case # 15 Coffee processing and marketing co-operative Size: 10 staff 400 farmers</p>	Zimbabwe	<p>Coffee beans Temperature increases (28° C to 35-38° C), erratic rainfall, mealy bug and fusarium fungus</p>	Mulching and training in water management and harvesting	None	N/A	• None that are relevant to smallholders	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Climate • Access to finance and low international prices • Drought-tolerant seeds and mechanisation needed; severe funding constraints
Higher-rainfall areas	<p>Case # 16 Tea and coffee processor; own estates Size: 163 staff Number of farmers: unknown</p>	Tanzania	<p>Tea and coffee sourced from the Kilimanjaro, Arusha, and Ruvuma areas Variable rainfall and drought in some areas (last season)</p>	None Ongoing extension support for outgrowers only	No external support	None	<ul style="list-style-type: none"> • Early warning systems • Use of inventory • Adjustment of supply chain • Imports where necessary 	<ul style="list-style-type: none"> • <i>No. 1 risk:</i> Product prices • Climate risks rank second • Cash flow availability • Need for new-generation growing stock and modern production methods • Irrigation schemes and farmer education

Type of rainfall area	Company	Country	Crops, area, and climate risks	Investment in smallholder resilience	External support	Investment in own farms	Business strategy, supply-chain response	Risks and issues affecting support for smallholders
Higher-rainfall areas	Case # 17 Tea processing company Size: 1,000 staff, 1,900 at peak 1,120 farmers	Zimbabwe	Tea in the Eastern Highlands Temperature rising (up to 38° C), reduction of rainfall, and one-month delay in season	Additional mulching and pruning, change in fertiliser application	Training provided by NGO in water and soil management	Replanting programme of 20 to 30 hectares per annum	• None that are relevant to smallholders	<ul style="list-style-type: none"> • <i>No. 1 risks:</i> Access to finance • Climate risks rank second • Access to finance affects support for outgrowers • Investment in R&D, especially drought and disease tolerant seeds
Higher-rainfall areas	Case # 18 Tea processing company - own estates Size: 4,000 (peak) 1,500 outgrowers	Zimbabwe	Tea & coffee in the Eastern Highlands Temperatures rising (24° C to 33° C), erratic rainfall, shorter seasons; drought (last year)	New planting stock and crop diversification	No external support	New planting stock and investment in irrigation	• Crop diversification and R&D focus	<ul style="list-style-type: none"> • <i>No. 1 risks:</i> Climate risks • Access to finance • External support is needed for irrigation, water catchment and storage, R&D support

The key results from the field study can be summarised as follows:

- All of the companies perceive climate risks to be significant. Other business risks - such as government intervention, market prices, and access to finance –are also considerable.
- In dry areas, none of the companies are directly investing in smallholder resilience. Direct interventions by agribusinesses are limited to activities such as soil moisture testing, crop monitoring, and supplying seeds to enable timely planting. Just over half of the companies are linked with donor and NGO programmes that support smallholders. Some of these programmes are aimed at responding to climate risks.
- Many companies in dry areas cite side-selling and defaults on loans as major reasons why they do not invest in smallholders.
- In higher-rainfall areas, companies rely on their own farms as well as outgrower programmes. These companies generally make limited investments in outgrowers and more significant investments in their own farms.
- Agribusinesses all respond to climate risks by adjusting their business and supply-chain strategies.
- Many of the companies believe that governments and donors have a role to play in improving the climate resilience of smallholders.

3.2 Conclusion

The interviews reveal that agribusinesses perceive both climate risks and other business risks to be significant. Agribusiness are generally not investing in building the climate resilience of smallholders, and are responding to climate risks through adjustments to their business and supply-chain strategies. The businesses view governments and donors as having a key role to play in improving smallholder climate resilience.

4 Findings and recommendations

The interviews yielded findings that have a number of potential implications for developing the resilience of smallholders. This chapter provides an overview of the findings under each hypothesis that was set out in Chapter 3. The chapter also provides a set of recommendations.

4.1 Agribusiness views on climate risks

Hypothesis 1: Agribusinesses commonly view climate risks as less important than the many non-climate risks that they need to contend with in Eastern and Southern Africa.

All of the companies interviewed perceive climate risks as important. This includes increases in temperatures, variable rainfall patterns, and, in some cases, pests and diseases.

In dry areas, seven of the thirteen companies ranked climate risks as the highest risk and two ranked climate risks second.³⁰ In addition to temperature increases, a number of companies reported perceived changes in the spread and timing of rainfall leading to changes in the timing of seasons and drought in some areas, such as southern Zambia and southern Zimbabwe. Increases in pests such as the borer worm and spider mites, believed to be caused by increases in heat, were also reported for crops such as cotton in Zambia. Scientific analysis will be required to verify the prevalence and causes of these pest infestations.

In higher-rainfall areas, two of the five companies ranked climate risks as the highest risk and three ranked climate risks as second. Some firms perceive major increases in temperatures, reaching 38 degrees Celsius in the upper highlands. The companies further reported erratic rainfall in the upper highlands in Zimbabwe and Tanzania, which led to drought in some areas. This could be a cause for concern and will require further investigation. A perceived increase in mealy bug and fusarium fungus on coffee farms in the Mutare area in Zimbabwe was reported.

Whilst climate risks seem to be a major issue for all of the agribusinesses, there are two factors that need to be considered. The first is that two of the three countries experienced severe drought in the season preceding the interviews. This may have contributed to a higher ranking of climate risks. These responses may also have been influenced by the fact that agribusiness respondents were aware that the primary purpose of the interview was to examine their responses to climate risks. Nonetheless, there seems little question that temperature and rainfall changes are a major concern.

Some of the companies reported significant decreases in production by smallholders. Despite this, it seems as though most firms were generally able to make up for shortfalls by adjusting their supply chains. It should further be noted that other factors such as productivity and world prices play a role in terms of crop output.

Pigeonpea seems to have performed well under dry conditions. The exception is Zambia, where pigeonpea performance is apparently low due to a problem with the quality of seed. Companies reported that sesame and mung bean, which were not among the sample crops, have performed well under dry conditions.

Whilst agribusinesses perceive climate risks as important, other risks such as government intervention, international prices, irrigation infrastructure, and access to finance are seen as important to the businesses. In dry areas, seven firms reported side-selling and two firms reported loan defaults by smallholders as impediments to investing in improving the climate resilience of smallholders. In higher-rainfall areas, tea and coffee plantations generally have closed supply chains, and only one company reported side-selling as a risk.

Discussion: The findings of the field survey do not substantiate Hypothesis 1, since businesses do consider climate change to pose a significant risk, and just over half of the companies rank climate risks first. The conclusion is that firms are worried about both climate risks and other business risks. In addition, agribusinesses were found to face risks such as side-selling, which affect investments in improving the resilience of smallholders.

Agribusiness perception of climate risks need to be understood within the context of broader market risks. The risks are interrelated, in that risks such as side-selling affect the propensity of agribusinesses to invest in smallholder resilience. Agribusinesses have to contend with so many day-to-day risks that they cannot reasonably be expected to

³⁰ Note that this is broadly indicative; some companies ranked other risks, such as market prices, as high as climate risks.

invest significantly in smallholders without support systems or incentives in place. Their responses to climate risks are therefore to adjust their business and supply-chain strategies.

Thus, the question that needs to be considered is the role of agribusinesses in improving the resilience of value chains. Van Rooyen examined whether commercial value-chain-dominated food systems work against smallholder agriculture and whether smallholders will eventually be excluded from value chains. Van Rooyen reported there are often commercial benefits for both smallholders and agribusinesses.³¹ Agribusinesses are important anchors to value chains. They link farmers to both local and export markets for crops and processed food products. They can also play an important role in quality control and logistics within value chains. Finally, agribusinesses often have an extensive network of company offices, agents, and depots and are therefore able to provide outreach to smallholders.

Given the correct incentives, agribusinesses are potentially able to disseminate technology, including drought- and disease-tolerant seed varieties, to small-scale farmers. The issue of incentives is discussed further under Hypotheses (2) and (5) below.

Recommendation: The recommendation for the Vuna programme is to carefully consider the role of agribusinesses in value chains when implementing programmes that improve the climate resilience of smallholders. The role of business should be to enable linkages to markets and the dissemination of technology. Government, donor, and NGO programmes should focus on building the climate resilience of smallholders. This means that partnerships should be encouraged in order to ensure that programmes address climate resilience holistically. The matter of partnerships is discussed further below. The perceived increase in pests and diseases amongst certain crops should also be looked into as this could pose risks to smallholders. Further analysis of seed quality, such as that of oilseed and pigeonpea, could also be undertaken.



Businesses do consider climate change to pose a significant risk, and just over half of the companies rank climate risks first.

31 Van Rooyen (2014).

4.2 Agribusiness investments in smallholder resilience

Hypothesis 2: Agribusinesses do not invest in smallholders if they are not sure that they will realise the benefits of such investments. If agribusinesses do invest, then such investments will be small (promoting the dissemination of improved seeds, for example) rather than significant (investments in water technology, for example).

The resilience of smallholders is a central issue of this study. None of the agribusinesses were found to be investing significantly in improving the climate resilience of smallholders. This is particularly the case when one considers the definition of resilience. As noted in Chapter 3, the FAO defines resilience as “the capacity of systems, communities, households, or individuals to prevent, mitigate or cope with risk and recover from shocks.” Resilient systems provide a solid base for promoting adaptive processes such as information, knowledge, and technologies. The limited investments in smallholders by the agribusinesses interviewed suggest that resilience is not being improved.

Although a number of companies have smallholder support programmes, these programmes are directly supported by donors and NGOs. The exception to this involves some agribusinesses that supply inputs on credit and where outgrower programmes are in place.

Table 3 below shows the overall trends across both dry and higher-rainfall areas.

Table 3: Overview of field study results

Type of rainfall area and number of firms	Perceived risks that are relevant to smallholders	Number of firms investing in smallholder resilience	Number of firms that have small-holder initiatives	Number of firms receiving external support for their small-holder initiatives	Number of firms responding by adjusting business and trade strategies	Number of firms with own farms and investments
Dry areas 13 firms	Temperature increases and drought. Certain crop pests Side-selling and loan defaults	None	7	7	13	1
Higher-rainfall areas 5 firms	Temperature increases and variable rainfall. Coffee pests and diseases. Access to cash flow	3	5	1	5	4

In dry areas, none of the firms are investing significantly in improving the resilience of smallholder farmers. Where interventions are made directly by these agribusinesses, these are limited to activities such as supplying seeds on time to enable timeous planting, soil moisture testing, and crop monitoring. Where external support is received, donor and NGO programmes are generally focussed on the provision of input credit, training in crop diversification, minimum tillage practices, and pest management practices such as spraying programmes.

As discussed above, the reasons for a lack of investment cited by firms include side-selling and defaults on loans. Firms are concerned about receiving a return on investments from small-scale farmers.

In higher-rainfall areas, all of the companies have outgrower programmes. Three of the companies are making limited investments such as training in mulching and pruning practices. One of the companies is providing new planting stock to smallholders. Only one company receives external support. A reason for the interventions by the tea and coffee companies could well be that the risks of side-selling are lower. The companies also cite a lack of resources such as access to finance as the reason for not making significant investments in smallholders.

Discussion: Hypothesis 2 appears to be substantiated. Agribusinesses do not invest in smallholders if they are not sure that they will appropriate the benefits of such investments. If agribusinesses do invest, then such investments are small. Agribusinesses prefer to rely on external support for improving the climate resilience of smallholders.

It is important to recognize that most of the initiatives that endeavour to improve smallholder resilience to climate risks within value chains are implemented by governments, donors, and NGOs. Agribusinesses have a commercial role to play, whilst public organisations have a developmental role. These roles are inter-related.

The effectiveness of donor and NGO programmes in improving the climate resilience of smallholders needs to be considered. Agribusinesses reported that farmers are unable to afford the interventions such as pest-control measures once donor programmes come to an end. Programmes must be designed to ensure sustainability. A number of companies reported minimal tillage and mulching as being highly effective. Some of the companies reported that conservation agriculture practices are effective, particularly when these practices are combined with more traditional tillage methods to ensure wider smallholder uptake.

Some of the companies believe that donors should also avoid supporting schemes that provide subsidised inputs to farmers. This results in market distortions and can prevent crop diversification, an essential mechanism for farmers to cope with climate risks. More prudent investments could include setting up input financing schemes to enable easier access to inputs. The agribusinesses believe that donors could further leverage their funding to support investments in R&D to develop new drought- and heat-resistant seeds, water infrastructure (such as irrigation and water catchment practices), and information and monitoring systems.

Recommendation: The Vuna programme should consider the input provided by agribusinesses on the types of donor interventions that are needed to ensure the climate resilience of smallholders. Existing donor and NGO programmes need to be assessed within priority value chains, and the sustainability of programmes needs to be a key consideration in terms of future programme design and funding. It may be more effective if programmes are jointly funded by donors and agribusinesses to ensure continuity once the donor funding component ends.

4.3 Business strategy and supply-chain responses to climate risks

Hypothesis 3: Agribusinesses primarily respond to production shortfalls by adjusting their business and trade strategies as opposed to investing significantly in small-scale farmers. Such adjustments may include broadening their catchment area for obtaining crops, diversifying products, or importing.

Table 3 shows that all of the agribusinesses adjust their business strategies and supply chains to cope with perceived production shortfalls.

In dry areas, a number of companies that trade in commodities are diversified across crops and already have extensive catchment areas. These companies adjust their supply chains and imports to make up for production shortfalls. For example, sunflower-oil processors and cotton ginners expand their catchment areas. Sunflower companies also import crude oil for refining. Two of the companies make use of forecasting and monitoring systems that are self-funded.

In higher-rainfall areas, major tea companies that source nationally are able to expand catchment areas and import, whereas other tea and coffee plantations have less flexibility. Two companies are investing in research and development (R&D) to develop drought- and disease-tolerant growing stock. Other business strategies, although not directly relevant to smallholders, include the reduction of overhead in order to make up for sales reductions.

Discussion: Hypothesis 3 is substantiated in that agribusinesses primarily respond to production shortfalls by adjusting their business and trade strategies as opposed to investing significantly in small-scale farmers. This means that firms are not pursuing the climate resilience of smallholders as part of their core business strategies.

The fact that many of the companies adjust their trading strategies is an important consideration. This points to a need for transparency in markets to enable businesses to know where crops will be available. This would enable effective supply-chain planning and allow smallholders to gain access to information such as weather forecasts that can encourage timely planting decisions. Companies expressed a desire for governments to publish planting, germination, and harvest reports so that both agribusinesses and smallholders can improve planning. Some of the agribusinesses also expressed the need for investment in information systems, including weather forecasting and crop monitoring systems based on data that can be obtained using satellite systems.

Recommendation: The Vuna programme may wish to undertake further analysis on the potential use of technologies such as satellite systems in weather forecasting and crop monitoring and look at ways in which governments can be supported in implementing weather forecasting and crop-reporting systems.

4.4 Agribusiness investments in own farms

Hypothesis 4: When faced with climate risks such as drought, agribusinesses that have their own farms - in addition to sourcing from outgrowers - may make adjustments to their crop management strategies (such as the adoption of new seed varieties, planting strategies, and water management) rather than investing significantly in outgrowers.

Most agribusinesses that have their own farms invest more significantly in those farms than in outgrowers.

The majority of these companies invest in new planting stock and planting strategies on their own farms. One large tea company has invested in irrigation on its own plantations. As discussed above, support to outgrowers is limited to practices such as mulching and pruning. The exception is one very large tea company that helps smallholders with new planting stock as part of its outgrower programme. The larger tea companies also facilitate international relationships such as Universal Trade Zone (UTZ) and Rainforest Alliance certifications for outgrowers. This helps with quality control.

Companies in higher-rainfall areas that have outgrower programmes generally make more direct (but still limited investments) in outgrowers for a number of reasons: these companies are reliant on production from the outgrowers, there are lower side-selling risks, and opportunities for the expansion of their catchment areas are more limited.

Discussion: Hypothesis 4 is substantiated in that agribusinesses that have their own farms make adjustments to their own crop management strategies as opposed to investing significantly in outgrowers. Specifically, agribusinesses are generally focussed on investing in their own farms as opposed to investing significantly in improving the climate resilience of smallholders.

A number of firms expressed the need for support in investing in irrigation and new seed varieties in order to improve the resilience of outgrowers. This will require further analysis by the Vuna programme. In addition, further synergies with other Department for International Development (DFID) programmes such as the Climate Resilient Infrastructure Development Facility (CRIDF) can be developed. This programme supports water infrastructure in partnership with large agribusinesses that have outgrower programmes.

Recommendation: A further study on the need for irrigation and water catchment schemes in tea and coffee growing areas is recommended. Further synergies with the CRIDF programme should be examined and the potential for extending partnerships with the private sector should be assessed.

4.5 Agribusiness views on future climate risks

Hypothesis 5: Most agribusinesses are not fully aware of the climate risks that they face in the medium term, over the next 20 to 40 years. Those that are aware of these risks do not have explicit strategies for responding because they are concentrating on more immediate business risks.

Most of the agribusinesses expressed concerns about future climate risks. However, companies generally did not make changes to their long-term business strategies in order to improve climate resilience, either within their own firms or amongst smallholders. Many of the companies expressed the view that government and donors should be supporting smallholders. This includes the need for investment in infrastructure, such as transport and irrigation, and new seed varieties that are tolerant to drought, heat, and disease.

Firms also expressed the need for governments to produce crop reports and provide weather forecasting information to enable farmers and agribusinesses to plan. Extension support also needs to be increased. In certain countries, such as Zambia, agribusinesses claimed that contract law needs to be improved to enable legal recourse for agribusinesses.

Given the plethora of day-to-day risks that agribusinesses need to contend with, it is not surprising that firms are not focussed on building the long-term resilience of smallholders. Trading companies, in particular, see themselves simply as buyers of crops, with their only role as connecting farmers to markets.

Discussion: Hypothesis 5 is generally substantiated in that agribusinesses generally did not express specific internal business strategies for building the long-term resilience of smallholders. The caveat to this hypothesis is that agribusinesses are highly aware of future risks.

Most of the companies believe that government and donors have a role to play in building smallholder resilience. Policy is important to managing volatility and enabling businesses to make rational decisions. Market interventions such as input subsidies for maize should be avoided since such interventions can act as a disincentive for farmers to diversify into commercial crops. Agribusinesses reported that crop diversification is an important strategy in developing the climate resilience of small farmers.

Agribusinesses believe that government should invest in infrastructure, transport, and irrigation, combined with water harvesting technologies and practices. They further believe that extension support needs to be increased. The firms interviewed also raised concerns about the quality of seed, particularly for sunflower, and new planting stock that is needed for tea. Alternatives - such as facilitating input credit schemes for seed in open value chains where side-selling risks are high - should be examined.

Recommendation: The Vuna programme should further consider the role of the public sector in programmes that are aimed at strengthening the resilience of supply chains. Vuna aims to be a catalyst for private and public sector investments over the longer term. Areas where major investments are required include infrastructure and research and development on new seed varieties. This will require partnerships with the private sector and research stations.

The interrelationship of various actors within value chains is important. The oilseed value chain is an example of how the above interventions are interlinked. Larsen and colleagues reported that actors within the sunflower value chain in Tanzania are starting to adopt innovative practices, such as farmers adopting new seed varieties and fertilisers through their participation in cooperatives. In addition, there are linkages between large and smaller oil millers, in which the larger firms provide filtration services to the smaller companies. This value chain further offers oilseed diversification and industrialisation benefits, as seen in Figure 2.

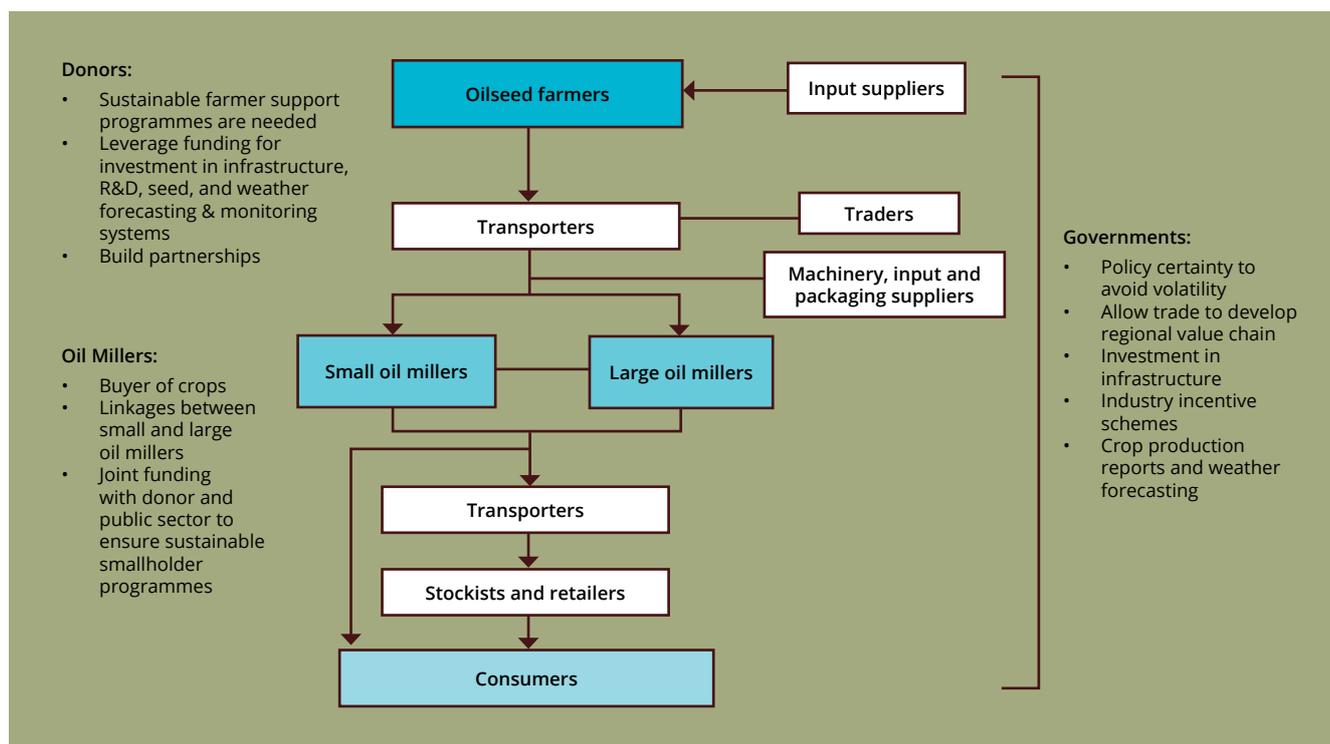


Figure 2: Building the resilience of oilseed value chains

Source: adapted from Larsen et al. (2009).

Many of the agribusinesses interviewed for this study cited the need for policy certainty and public investment in areas such as new seed varieties. The resilience of small-scale farmers needs to be improved through public-private partnerships, in particular programmes that are sustainable. In addition, many of the sunflower companies crush a variety of seeds when faced with production shortfalls, and this can encourage crop diversification amongst smallholders. Oil millers also contribute to building regional value chains by importing crude oil for processing.

4.6 Conclusion

Agribusinesses perceive a range of climate risks in both dry areas and higher-rainfall areas. Although agribusinesses view climate risks as important, they cite side-selling and loan default risks as constraints to investing in smallholders. Agribusinesses respond to climate risks by adjusting their business, marketing, and trade strategies. Agribusinesses are unlikely to support the improvement of smallholder resilience to climate risks on their own. Therefore, helping smallholders will require public-private partnerships, including co-funding arrangements to help ensure programme sustainability.

A number of areas of further research for the Vuna programme have been recommended. These include an assessment of current donor programmes in order to understand the gaps in improving the climate resilience of smallholders, investigating changing incidences of pests and diseases, research on the use of satellite systems in weather forecasting and crop monitoring, exploring further synergies with the CRIDF programme, and further consideration of how to support public-sector investments in R&D and infrastructure.



Although agribusinesses view climate risks as important, they cite side-selling as a constraint to investing in smallholders.

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Annex 1: Case studies

Dry areas – cotton, pulses and sunflower

Case # 1: Commodity trading company – Zambia

Type of business: Privately owned trading company involved in grain storage and trading (grains, groundnuts, soya) and sunflower oil production. Size: 60 staff.

Relevant crops purchased from smallholders: Sunflowers.

Relationship with smallholders: Crops are purchased through depots and small traders. The company does not have smallholder support programmes. Farmers are supported by government programmes. The firm purchases all of the above crops from around 20,000 to 30,000 farmers. The company also carries out work with NGOs and acts as a buyer of crops to provide access to markets for small-scale farmers.

Perceived climate risks: Many regions were affected by variable rainfall with drought and delayed rains occurring in certain areas such as the Southern Province last season.

Ranking of risks: Major risks and the corresponding ranking in terms of importance to the business are climate risks (1), side-selling (2), government policies such as intervention in the maize market (3), and access to finance (4).

Long-term view on climate risks: The company believes that temperatures will continue to increase, affecting pollination and flowering. Drought-resistant crops need to be encouraged.

Investments/production responses with smallholders: None.

Business strategy responses: Sunflowers are procured from small-scale farmers on a spot-price basis for mainly open contracts. The company does not enter into fixed volume/fixed price contracts for sunflowers. The company is diversified across three provinces in terms of its catchment area and can absorb shortfalls in production. The firm also gains access to sunflowers through its work with NGOs. The business is diversifying its product basket into crops such as pulses in order to further manage risks.

Key issue: The government's maize subsidies are distorting the market. For example, input subsidies for maize discourage farmers from diversifying into commercial crops such as sunflowers. The company carries expensive inventory to manage volatility.

Conclusion: Although the company views climate risks as important and believes that these risks will continue in the future, this firm is a trader and does not invest in smallholders or intervene in their production processes. The business is diversified across catchment areas, and this helps to manage risks. There is no direct donor or NGO support for smallholders.

Case #2: Commodity Trading Company – Zambia

Type of business: This multinational business includes input supply, commodity trading (cowpea, maize, and soya), grain storage, and cotton ginning. Size: 250 staff, 2,400 at peak season.

Relevant crops purchased from smallholders: Cotton.³²

Relationship with smallholders: Outgrower contractual relationship. Support includes input supply, training provided by an external company, and a mechanised yield improvement project, benefiting over 40 farmers. This scheme is now incorporated under the Competitive African Cotton Initiative (COMPACI) programme, which is coming to an end. The initiative is under consideration by Vuna. The company procures from 80,000 to 100,000 farmers.

³² This company only discussed cotton procurement from small-scale farmers.

Perceived climate risks: There were major variations in rainfall experienced over the last two years in Zambia, with certain areas heavily impacted by a lack of rain. The company perceived that crop intake targets for cotton reduced by 20% to 30%.

Ranking of risks: Key risks include prices for inputs and crops (1), climate risks (2), and side-selling (3).

Long-term view on climate risks: Climate risks will remain an issue in the future. More emphasis needs to be placed on building the cotton sector in Zambia as part of the industrial development drive.

Investments/production responses with smallholders: The company facilitated weather index insurance for small-scale farmers. The product was provided by an NGO and protects the value of inputs supplied by the firm. The scheme has grown from around 5,000 farmers to 52,000 farmers. Vuna has assessed this scheme under a separate project. The firm did not make any other changes in investments or production interventions with smallholders.

Business strategy responses: The company is looking at expanding into other catchment areas.

Key issues: Side-selling is a risk in terms of supporting outgrowers. A code of conduct has been agreed amongst ginners (under the Cotton Act). This includes a penalty system in which district committees report side-purchasing to a buying committee. This will help to manage the risk, but at times farmers do not have the option and sell to the highest bidder. A proper legal framework is needed to ensure effective contract law. In addition, hedging is expensive, and foreign exchange market (FOREX) volatility affects earnings, which in turn determines the amount of cash that can be made available to support investments in smallholders.

Conclusion: The company views climate risks as important. Weather insurance for inputs was supported by an NGO. Side-selling was reported as an impediment to supporting smallholders. There were no direct investments or production interventions with respect to smallholders in response to climate risks.

Case #3: Commodity Trading Company - Zambia

Type of business: Privately owned multinational business. The company is involved in the supply of inputs and commodity trading (maize, soya, sunflower, and wheat). Size: 20 staff.

Relevant crops purchased from smallholders: Sunflower.

Relationship with smallholders: The company is a trader only and commodities are purchased on a spot basis. Farmers deliver to one depot in each province. Some input financing is provided but most farmer support is provided by NGOs and the National Farmers Union. The number of farmers is unknown.

Perceived climate risks: There were delays in the onset of rains but not a full-scale drought last season. The company reported that 60 - 70% of typical yields for sunflower were perceived due to a shorter season. An increase in lava was encountered during one season. This is perceived to be due to higher temperatures.

Ranking of risks: Major risks are climate risks (1), government policies, especially intervention in the maize sector (2), input and product prices (3), and trading risks including millers not honouring contracts and side-selling by farmers (4).

Long-term view on climate risks: Changes in rainfall are likely to continue. A reliance on rain-fed production and a lack of irrigation means that climate risks will be significant. The company will consider increasing international trade to counter regional climate risks.

Investments/production responses amongst smallholders: The company encourages farmers to diversify crops through the support provided by NGOs. A spraying programme was initiated and the lava pest was completely eradicated. This was supported by the government.

Business strategy responses that are relevant to smallholders: The company does not build up inventory or import to counter production shortfalls. The firm has achieved in-take volumes due to the extent of its catchment area.

Key issue: Trading risks such as side-selling and reduced sales affect support to farmers. Government intervention in the maize sector is affecting cash flows within the company.

Conclusion: Whilst climate risks are viewed as important, the company is reliant on NGOs to support smallholders. The company's interventions with smallholders are limited to encouraging crop diversification and a spraying programme to combat pests (reported to be successful). The firm makes up for production shortfalls through its extensive catchment area. Side-selling and limited cash flow are impediments to investments in smallholders.

Case #4: Cotton ginnery – Tanzania

Type of business: Privately owned cotton ginnery; operating in Zambia, Zimbabwe, and Tanzania. Size: 185 staff, 1,000 at peak season.

Relevant crops purchased from small-scale farmers: Cotton.

Relationship with small-scale farmers: Contractual. The ginnery supplies inputs on credit and extension services. Support from an NGO is currently in place through a three-year contract. This contract is coming to an end. Cotton is procured from 23,558 farmers.

Perceived climate risks: Weather patterns have changed over the last ten years. In the western area of Mwanza, the planting season has been delayed beyond mid-November. Some areas are exposed to drought, and other areas are receiving excessive rainfall. Productivity has been increasing but national cotton production has fallen from 354 million kilogrammes in 2012 to 120 million kilogrammes in 2016, due to a perceived lack of quality seeds and weather risks. Seeds from 1991 are being used, and a new seed variety is currently being developed. There has been a noticeable increase in pests such as the borer worm, seemingly due to increased heat.

Ranking of risks: Risks that are faced by the company include climate risk (1), consistent commodity supply (2), product pricing (3), and side-selling (4).

Long-term view on climate risks: The company believes that global warming will continue to be a risk, resulting in extended drought. Farmers need to be educated on the risks of timely planting. The timely supply of inputs, minimum tillage and new drought-tolerant seed varieties are critical.

Investments/production responses with smallholders: New seed varieties are being looked at. The company focusses on the timely supply of inputs to enable timeous planting. New techniques for farming are being introduced such as minimum till practices (impact of 400 kilogrammes yield per acre output vs. 100 kilogrammes per acre output). Spraying is undertaken to combat the borer worm.

Business strategy/supply chain responses: The company has expanded its catchment area, but there are problems with the yield and quality in the country. Most of the 40 ginners in Tanzania are operating below capacity.

Key issues: To address side-selling, regional and district committees are being established to ring-fence certain areas for companies to purchase from. The company believes that this will be effective. In addition, low production output, quality, and prices remain challenges. Low production results in lower profits. Low market prices inhibit the company from paying higher prices to farmers. Quality problems result in claims from buyers. These factors affect cash flow available to support farmers.

Conclusion: The company views climate risks as important. NGO support is provided to small farmers. Support is centred around new seed varieties, timely input supply and minimum till practices. Side-selling and cash flow constraints are risks to the company investing in smallholders.

Case #5: Cotton ginnery – Zambia

Type of business: Privately owned cotton ginnery; operating in Zambia, Zimbabwe, and Tanzania (part of the same firm discussed in case study 7). Size: 113 staff, 1,600 at peak.

Relevant crops purchased from small-scale farmers: Cotton seed.

Relationship with small-scale farmers: Sourcing of cotton seed from around 40,000 farmers through contract farming. Provision of inputs through loans to small-scale farmers. Training by 71 district staff, including agronomists. The COMPACI programme also provides training.

Perceived climate risks: Changes in rainfall patterns are a key risk. Some areas have experienced droughts, and other areas have experienced rainfall. A year later this pattern may then alter, with dry areas receiving rainfall. Delayed rainfall also resulted in a shorter, three-month season, which affected yields last season. Borer worms are also a major risk when it is drier. Yields are normally two tonnes per hectare, reducing to 380 kilogrammes per hectare last season.

Ranking of risks: Risks that are deemed to be very important to the business include price risks and climate risks. Moderately important risks include FOREX risks and crime (the company did not wish to rank the risks since the risks vary from year to year).

Long-term view on climate risks: The company believes that variable rainfall patterns will be a significant risk in the future. Donor support for drip irrigation technology and pest programmes is needed.

Investments/production responses with smallholders: The business monitors germination and if levels are sub-optimal, the provision of inputs is scaled back in order to manage returns. A spraying programme was launched to counter the borer worm. The COMPACI programme also established successful trial molasses traps. The programme has now ended and farmers cannot afford the costs.

Business strategy/supply chain responses: The company sources from a number of provinces and is diversified in terms of catchment area; sourcing from the eastern part of Zambia due to drought risks in southern Zambia. Despite adjustments in the supply chain, business losses can still be experienced.

Key issues: The level of germination affects the amount of input that the firm can afford to provide to outgrowers. This then impacts the income for outgrowers. Debt defaults are also an issue. The company absorbs the impact of bad debts when inputs are supplied to farmers (only 80% of input costs are recovered). Side-selling was a major risk two years ago, but the code of conduct has managed this risk whilst prices are stable.

Conclusion: Climate risks are deemed to be important. Smallholders are supported by NGOs. The sustainability of donor programmes is a major issue that needs to be considered. The business focusses on monitoring germination levels and spraying and not on other interventions. Defaults on debt affect support to outgrowers.

Case #6: Cotton ginnery – Zambia

Type of business: Privately owned cotton ginnery; operating in Malawi and Zambia. Part of a multinational group. Owner of three cotton ginneries (total capacity of 75,000 metric tonnes per year).

Relevant crops purchased from small-scale farmers: Cotton.

Relationship with small-scale farmers: Contractual with outgrowers. Support includes the provision of inputs on credit, monitoring planting to manage exposure, and training in pest management, soil conservation, and harvesting. Training is also provided for women farmers. There is no external support. Cotton is sourced from 46,000 farmers.

Perceived climate risks: Variable rainfall patterns are the most significant risk. This results in drought in some areas and changes in the timing of seasons. Rainfall was limited in southern Zambia, whilst the eastern part received rainfall during the last season. Spider mites also increase, possibly due to temperature increases.

Ranking of risks: Risks include cotton prices (1), side-selling (2), climate risks (3), and government policies such as market intervention (4).

Long-term view on climate risks: Temperature increases and variable rainfall are likely to continue. Freshwater reserves are also threatened, a situation that affects water resources and fish stocks. The biggest challenge is the costs of transport, which affects prices that are paid to farmers. Farming productivity needs to be increased as levels have been consistent over the last ten years. There is a need for government and NGOs to improve extension support. Deforestation needs to be curbed, as this affects other crops and CO₂ emissions.

Investments/production responses with smallholders: Spraying to combat spider mites was undertaken. There is no additional direct production support provided to farmers.

Business strategy/supply chain responses: The company operates in all cotton growing areas of Zambia. The extent of the company's geographic coverage acts as a natural hedge to climate risks.

Key issue: The code of conduct amongst ginneries will help to mitigate the risk of side-selling in Zambia. However, side-selling is a major risk in Malawi, with up to 80% of intake volumes impacted and the cotton industry could collapse in Malawi.

Conclusion: Climate risks rank third and side-selling has a higher ranking. There is no external support provided by donors or NGOs and the company has not made any changes in its support to outgrowers as a result of climate risks. The company sources crop from a number of growing areas.

Case #7: Cotton processor - Tanzania

Type of business: A privately owned company involved in the production of cotton oil, cotton lint, and cotton cake (animal feed). Size: 300 to 400 staff at peak season.

Relevant crops purchased from small-scale farmers: Cotton seed and sunflower seed.

Relationship with small-scale farmers: The company provides seed to farmers at a lower price through a credit scheme. Support, including credit support, is provided by the Cotton Development Trust Fund (CDTF). The company procures cotton seed from around 14,000 farmers.

Perceived climate risks: There has been a noticeable increase in temperatures over the past two to three years, and rainfall patterns are variable. The company perceives that production in the Kahama region reduced by more than 50%.

Ranking of risks: Major risks faced include inconsistent commodity supply (1), low international prices (2), the recovery of loans from farmers (3), side-selling (4), and climate risks (5).

Long-term view on climate risks: Ongoing rainfall changes are expected in the future. Production will be impacted and prices will be affected. Support from government is needed, including access to quality seed and lower interest rates.

Investments/production responses amongst smallholders: Seeds were distributed in time to enable timely planting. There were no investments made.

Business strategy responses that are relevant to smallholders: The company has generally absorbed the loss. The company started with cotton and has now shifted its catchment area to another region in order to source sunflower (due to shortages in the Kahama area).

Key issues: Loan recovery, reductions in output, and cash flow constraints affect the ability to support small-scale farmers.

Conclusion: Climate risks rank fifth in terms of importance. The company's interventions with smallholders were limited to supplying seed to enable timely planting. Loan recovery and cash-flow constraints were reported to be an impediment to investing in smallholders.

Case #8: Cotton and soya processor - Zimbabwe

Type of business: A cotton seed and soya processing firm. Products manufactured include soap powder, toiletries, and cooking oil. Size: Formerly 300 staff, but now reduced.

Relevant crops purchased from small-scale farmers: Cotton seed was sourced until very recently. Due to production shortfalls, only soya is now sourced.

Relationship with small-scale farmers: The company has been working on a contract basis with about 200 farmers in the Bulawayo area. The company buys from farmers who are part of irrigation schemes. Seed, fertiliser, and chemicals are provided to farmers on credit. Technoserve supports training, including assistance with funding.

Perceived climate risks: Rainfall has been erratic in the Bulawayo area. Last season rains came in March as opposed to late December. This affected cotton production. Hail storms also destroyed most of the crops in some areas.

Ranking of risks: Key risks include high business costs such electricity, water, and labour (1), access to finance, including high interest rates (2), climate risks (3), and competition from cheap imports (4).

Long-term view on climate risks: Temperature increases are likely to continue, and more erratic rainfall patterns are likely. Government, NGOs and the private sector need to support farmers. Conservation agriculture practices are important.

Investments/production responses with smallholders: Replanting was undertaken after hail storms. No additional production interventions were made.

Business strategy/supply chain responses: Due to supply constraints, crushing was stopped and crude oil was imported for refining. The government also banned the import of processed cooking oil, which helped the local industry. The option of going into alternative oil seeds, such as sesame and sunflower, is being considered.

Key issues: Access to finance and low international prices affect the ability to invest in outgrowers. Some farmers secured credit from Agri Bank to buy inputs. Side-selling is not a risk as there are not many buyers in the area.

Conclusion: Climate risks are ranked third in importance. Replanting was encouraged after hailstorms. There were no other interventions with smallholders. The company is diversifying into other crops.

Case #9: Exporter – Tanzania

Type of business: Privately owned trading company involved in the trading (mainly export) of cashew nuts, groundnuts, pigeonpea, sesame seeds, and sunflower seeds. Size: 160 staff.

Crops purchased from small-scale farmers: Pigeonpea and sunflower seeds.

Relationship with small-scale farmers: Some contractual arrangements with small-scale farmers, but procurement is mainly done through depots and agents. There is no external support. The company buys from around 300 farmers per commodity.

Perceived climate risks: There have been noticeable increases in temperatures. There has also been unpredictable rainfall. Last season, rainfall in April resulted in excess water in some areas. Pigeon-pea has been highly successful in Tanzania over many years as it is a hardy crop, with the total crop reaching 200,000 tonnes last season.

Ranking of risks: Major risks faced by the company include security (1), climate risks (2), infrastructure (3), and productivity including farmer knowledge and skills (4).

Long-term view on climate risks: Unpredictable weather is likely to continue. The weather insurance market should be developed and farm cooperative societies need to be established. The government should provide data including seedling reports, three-month reports, and an end-of-harvest report for specific crops to enable business planning. Business sentiment is the biggest driver for all actors, from farmers to the end buyer.

Investments/production responses with smallholders: There are no direct production interventions to deal with weather risks.

Business strategy/supply chain responses: Volumes are secured through an extensive catchment area. However, quality is generally the problem. Purchasing is scaled back and export contracts are limited when there are quality problems.

Conclusion: Whilst climate risks are viewed as relatively important, the company is solely focussed on trading and does not invest in smallholders. There is no external donor or NGO support. Side-selling used to be an issue, and the co-operatives are managing this risk.

Case #10: Exporter and food processing company – Zambia

Type of business: A multinational involved in input supply, cash-traded products (groundnuts, cowpea, pigeonpea, sesame, and soya), exchange traded products (grains and oilseeds), sunflower oil, breakfast products, and warehousing and logistics. Size: \$5 billion turnover.

Relevant crops purchased from small-scale farmers: Cowpea and pigeonpea.

Relationship with small-scale farmers: Commodity purchases through depots. Inputs such as seed are sold to farmers. The company also provides information to farmers on fertiliser applications, demonstration plots, assistance with pests and diseases, and some training and agronomy support. There is no external support. Size: The number of farmers is unknown.

Perceived climate risks: Many regions were affected by delayed rainfall, which resulted in shortened crop seasons.

Ranking of risks: Key risks faced by the company include climate risks (1), input and market prices (2), and input supply markets (3).

Long-term view of climate risks: Ongoing variability in rainfall is expected, which will affect small-scale farmers. Farmers need to diversify into commercial crops. Information-sharing is also important, including weather forecasting.

Investments/production responses with smallholders: Soil testing was undertaken to test moisture. Information was provided to farmers to enable planting and fertiliser application decisions.

Business strategy/supply chain responses: The business is well diversified across products and regions. There are depots throughout most agricultural regions in Zambia. If production shortfalls are encountered, the company adjusts its supply chain and will import if necessary.

Conclusion: No key issues were identified. Side-selling does take place, but the company can absorb this risk due to diversification and by building and entering into formal relationships with farmers.

Case #11: Sunflower oil company – Tanzania

Type of business: A privately owned Tanzanian company involved in sunflower oil processing and sunflower cake for animal feed in the Singida region. The company has its own farms and purchases crops from small-scale farmers. Size: 22 staff, 40 at peak season.

Relevant crops purchased from small-scale farmers: Sunflower seed.

Relationship with small-scale farmers: Funding is offered to farmers for inputs. The off-take of crops is at market-related prices. Crops are purchased from around 250 contract farmers and around 1,000 farmers (procurement). There is no external donor or NGO support.

Perceived climate risks: There was insufficient rainfall in certain areas resulting in drought two seasons ago. This had a perceived 50% impact on production. This is contrasted to good rainfalls in the area last season.

Ranking of risks: Major risks including climate risks (1), access to finance (2), input supply markets, including quality seed (3), high production costs (4), and competition (5).

Long-term view on climate risks: The company believes that climate change is a global issue, and ongoing rainfall variability is expected. The firm needs to invest in new implements on its own farms to ensure effective farming practices, such as deep ploughing.

Investments/production responses with smallholders: None

Investments/production responses in the company's own farms: Investments in new implements, such as deep ploughing machinery.

Business strategy/supply chain responses: The company imports crude palm oil for processing and is diversifying into crops such as cotton seed. The catchment area was also expanded. Plant capacity runs at about 70%.

Key issue: Climate risks affect production, which in turn affects profits and the ability of the company to support outgrowers.

Conclusion: Climate risks are viewed as very important to the business.

Case #12: Sunflower oil company – Zambia

Type of business: A privately owned multinational company involved in sunflower oil processing, soya, and cotton seed. Operations in Eastern and Southern Africa. Size: 350 staff.

Relevant crops purchased from small-scale farmers: Cotton and sunflower.

Relationship with small-scale farmers: There are formal contracts in place with dealers, agents, and product aggregators who source crops from smallholders. The firm does not receive external support. The number of farmers is unknown.

Perceived climate risks: Drought has occurred in certain areas. This has caused commodity price increases.

Ranking of risks: Major risks include competition (1), infrastructure challenges (2), and climate risks (3).

Long-term view on climate risks: Variations in rainfall are already being experienced. Supportive institutions and an outgrower scheme are needed.

Investments/production responses with smallholders: None

Business strategy/supply-chain responses: The business adjusts its trading strategy when faced with climate risks. Other seed types will be crushed, and crude oil will be imported for refining.

Key issue: Competition affects business, which affects the volume that is sourced, which in turn affects production by farmers.

Conclusion: Climate risks are ranked last in terms of importance. There is no external support provided to smallholders and the company does not invest in smallholders.

Case #13: Sunflower oil company – Zimbabwe

Type of business: A privately owned small sunflower oil processing and consumer retail company in the Mutoko region. Size: 6 staff.

Relevant crops purchased from small-scale farmers: Sunflower seed.

Relationship with small-scale farmers: Buyer only, purchasing crops from small-scale farmers. External support is provided by NGOs in the surrounding catchment area. The number of farmers is unknown, as buying takes place through traders.

Perceived climate risks: Variable rainfall has been experienced. Mutoko used to be a higher-rainfall area but has become much drier over the last five years. Variable rainfall caused the last season to start late. The full crop intake of sunflowers was not realised last season. Thirty tonnes were expected and only around 10 tonnes were received by the company.

Ranking of risks: Key risks are side-selling (1), climate risks (1), access to finance (2), input supply markets, particularly access to quality seed (2), and crime (3).³³

Long-term view on climate risks: Temperatures are likely to continue to increase. Rainfall patterns will also be erratic. Water infrastructure such as dams and irrigation schemes are needed. There are indications that the government will now support a dam in the area. The use of retained seed from harvesting for replanting reduces the oil content.

Investments/production responses with smallholders: The company is encouraging farmers to diversify crops to manage risks. Some assistance with production in the form of training was provided. Farmers were also linked to micro-finance institutions.

Business strategy/supply-chain responses: None reported.

Key issues: Side-selling has a major impact on investment. Companies are generally reluctant to invest when faced with this risk. In addition, access to finance and low international prices affect resource availability for investment. The capacity of farmers needs to be developed so that they can repay credit.

Conclusion: Whilst climate risks are very important to the company, the company can no longer invest in smallholders due to side-selling risks. Support to smallholders is provided by an NGO. Investment in irrigation and new seed varieties to increase oil content are important.

Higher-rainfall areas – tea and coffee

Case #14: Agro-processing company – Tanzania

Type of business: An industrial conglomerate in energy, petroleum, and agriculture (cashew nuts, cotton, mung beans, palm oil, pigeonpea, sisal, sugar cane, and tea). Operations include sisal and tea plantations, processing (maize and oil), and textile mills. Operations in Eastern Africa, Southern Africa, and Central Africa. Size: 24,000 staff.

Relevant crops purchased from small-scale farmers: Tea.³⁴

Relationship with small-scale farmers: Outgrower relationship with small-scale farmers for tea and sugar cane. Other crops are procured nationally through a network of company branches. Tea outgrowers are supported with inputs at a nominal cost, extension services, and transport. There is no external support. The number of small-scale farmers is not known.

Perceived climate risks: Increases in temperatures have been noticeable, even in higher altitude areas. Tanzania has seven agro-climatic zones, and some zones are prone to moisture deficiency throughout the year. Rainfall patterns have been changing over the last ten years. Some perennial rivers are dry. Borehole water is being used for its own farms, and the water table is reducing. There has been a 20% reduction in tea output.

Ranking of risks: The main risks and ranking are competition from imports (1), climate risks (2), access to production technology (3), financing including FOREX risks (4), and labour productivity (5).

³³ Firms ranked certain risks equally.

³⁴ This company mainly discussed its outgrower programmes, in particular sisal and tea.

Long-term view on climate risks: Climate change is an on-going risk that will continue to be faced. The company believes that the government should facilitate irrigation projects combined with water conservation methods. Climate risks need to be incorporated in farming practices. Donors should facilitate access to quality/drought-resistant seed and linkages between farmers and additional agro-processing capacity should be developed.

Investments/production responses with smallholders: None.

Investments/production responses on the company's own farms: The company has invested in boreholes and high-yielding cultivars (that withstand high plant densities) on its own farms.

Business strategy/supply-chain responses: The company is highly diversified in terms of products and has an expansive catchment area across the country. The company will also import crops to make up for production shortfalls.

Key issues: Side-selling is the key reason why large agro-processing companies do not typically enter into outgrower agreements, especially at fixed prices. The companies are often unable to recoup their investments due to side-selling.

Financing and financial performance: The company reports that the high cost of finance and reduced profits lead to lower returns and therefore less cash flow to support outgrowers.

Conclusion: The company perceives climate risks as important, especially increases in temperatures. The firm has an extensive catchment area and will import crops to make up for production shortfalls. The business does not make new investments among outgrowers to improve climate resilience. The firm seems to believe that it is the responsibility of governments and donors to assist smallholder farmers with improving climate resilience.

Case #15: Coffee processing company - Zimbabwe

Type of business: A co-operative entity involved in coffee processing and marketing. The company does not have its own farms. Size: 10 staff.

Relevant crops purchased from small-scale farmers: Coffee beans.

Relationship with small-scale farmers: A margin is taken by the company for processing and coffee sales. Agronomic training is provided with NGO assistance. This is an 18-month programme. A 50% advance used to be paid to farmers, but this is no longer possible due to cash-flow constraints. Coffee beans are procured from 400 farmers.

Perceived climate risks: Temperatures are rising in the Eastern Highlands (from 28 degrees Celsius four to five years ago to 35-38 degrees Celsius over the last few years). Erratic rainfall patterns are also being experienced (15-day intervals reducing to 40-day intervals). There has also been a perceived increase in the mealy bug and the fusarium coffee fungus, possibly caused by increasing temperatures. In addition, a cyclone was experienced a few years ago, destroying 40% of smallholder plantations.

Ranking of risks: Key risks include climate risks (1), access to finance (2), inconsistent commodity supply (3), prices for products (4), and labour productivity (5).

Long-term view of climate risks: Temperature increases are likely to continue. Higher-rainfall is expected this year. The Coffee Research Station is carrying out R&D and trials on drought-tolerant varieties, but funding is an issue. There is also a lack of funding for irrigation schemes.

Investments/production responses with smallholders: Mulching practices are being applied to conserve soil moisture. New topics on water management and water harvesting have been introduced for farmer training. Information on the impact was not provided.

Business strategy/supply chain responses: None that are relevant to smallholders.

Access to finance and low international prices: Access to finance is constraining the ability to access new planting stock. Constrained output affects the company's financial performance, which limits resources that can be invested in farmers. Around 70% of farmers require irrigation.

Conclusion: The company is worried about perceived increases in temperatures, highly erratic rainfall, and an increase in the fusarium coffee fungus. Efforts in improving the resilience of smallholders is limited to mulching practices and water management. There is a lack of funding for new planting stock, irrigation schemes, and R&D on pest management.

Case #16: Tea and coffee processing company – Tanzania

Type of business: The business is involved in tea and coffee blending, marketing and various value-added products such as instant coffee, sugar, and coffee creamers. The company exports to a number of countries. Size: 163 staff.

Relevant crops purchased from small-scale farmers: Tea.

Relationship with small-scale farmers: Tea is grown on the company's own estates and is purchased from outgrowers. Training in farming practices and demonstration sites is provided to outgrowers. There is no external support. The company procures from many thousands of outgrowers (precise number unknown).

Perceived climate risks: Variable rainfall resulted in an extended drought in some areas last season. Growing areas include Kilimanjaro, Arusha, and Ravuma areas. This resulted in a perceived 30% reduction in harvest volumes. There may be possible harvest losses this year due to delayed September rains.

Ranking of risks: Risks include pricing pressure from customers (1), climate risks (2), high business costs including VAT recently introduced on commodities (3), access to finance (4), and competition where competitors are subsidizing imports to gain a foothold in the market (5).

Long-term view of climate risks: Extended drought seasons are expected in the future. Investment in new planting stock is needed. Modern production methods are needed. Government needs to step in to support small-scale farmers, and farmers need to be educated on climate risks.

Investments/production responses with smallholders: None.

Investments/production responses on the company's own farms: None reported.

Business strategy/supply chain responses: The company had early warning of the drought and adjusted its supply chain to meet inventory. Imports were needed to supplement shortfalls in inventory.

Key issue: Cash-flow constraints affect the ability to support outgrowers. Products need to be downscaled, which affects purchases of commodities.

Conclusion: The company perceives climate risk as important, and saw it as the cause of a shortfall in production last season. The company adjusts its supply chain, including imports, to counter shortfalls. There were no investments to improve the climate resilience of smallholders.

Case # 17: Tea processing company – Zimbabwe

Type of business: Privately owned tea processing company in the Eastern Highlands. The firm has its own estates and an outgrower programme. Size: 1000 staff, 1,900 at peak season.

Relevant crops purchased from small-scale farmers: Tea.

Relationship with small-scale farmers: Seedlings are sold to farmers at cost. Technical support includes training on business skills, taking of soil samples, contour building, and erosion-prevention measures, supported by the Dutch NGO, Stichting Nederlandse Vrijwilligers. Outgrowers are certified by UTZ and the Rainforest Alliance. There are a total of 1,120 outgrowers.

Perceived climate risks: Temperatures have increased from around 34-35 degrees Celsius to 38 degrees Celsius over the last few years. Rainfall has reduced (from 1,400 to 1,000 millimetres per annum), the onset of rain has shifted from September to October, and three quarters of annual rain can be received within one month. Production volumes are perceived to have fallen by between 8% and 10%.

Ranking of risks: Major risks faced by the business include access to finance (1), regulatory compliance (2), high business costs, including wage increases (3), low product prices (4), infrastructure challenges including the reliable supply of electricity (5), and climate risks (6).³⁵

Long-term view of climate risks: Temperatures are likely to continue to increase. Higher rainfalls are expected this year. Investment in R&D for drought and disease resistance and new planting stock is needed.

³⁵ The company ranked certain risks equally.

Investments/production with smallholders: Additional mulching and pruning is undertaken. Three applications of fertiliser instead of two are undertaken during a season. The impact has not been quantified.

Investments/production responses on the company's own farms: A replanting programme has been adopted, as most teas were planted 40 to 50 years ago.

Business strategy/supply-chain responses: None that are relevant to smallholders.

Key issue: Access to finance affects the ability to invest in and support outgrowers.

Conclusion: Climate risks are perceived to be important, especially increased temperatures and reduced rainfall in the upper highlands. External support is limited to training. Responses by the company to improve the resilience of outgrowers are limited to mulching and changing the rates of fertiliser application. The company believes that investment is needed for R&D in drought and disease resistance.

Case #18: Tea processing company - Zimbabwe

Type of business: A privately owned tea processing company in the Eastern Highlands. The company also produces coffee and macadamia nuts. The business has its own estates and sources tea from outgrowers. Size: 4,000 at peak season (includes 1,800 contract workers).

Relevant crops purchased from small-scale farmers: Tea.

Relationship with small-scale farmers: Outgrower programme. Sharing of mechanised equipment such as tractors takes place. Fertilisers and seedlings are provided through loans. The company helps with certification such as the Rainforest Alliance certification. Training in production is provided. No other external support is received. There are 1,500 outgrowers.

Perceived climate risks: Temperatures have been increasing (from around 24 degrees Celsius, with heat waves of 33 degrees experienced last season). There have been shorter rainfall seasons, and rainfall has been erratic. Delays in rainfall from September to December or January have been experienced. Over the last two years, it rained for only 2 to 3 months, and then drought was experienced. Production of tea reduced from 10,000 tonnes per annum to only 6,500 tonnes.

Ranking of risks: Major risks include climate risks (1), economic risks (2), labour productivity (3), and government policies and onerous regulatory requirements (4).

Long-term view: Climate change is a worldwide risk. More severe drought with high temperatures, as well as more diseases, are expected. Flooding is likely to take place in lower-lying areas. Donor support for dams, water catchment, and R&D is needed. This needs to be located around proper irrigation schemes.

Investments/production responses with smallholders: New planting stock is being introduced amongst outgrowers. The Tea Research Foundation and the Zimbabwe Tea Growers Association are involved on a commercial basis.

Investments/production responses on the company's own farms: New planting stock is being introduced on the firm's own farms. The company has also introduced irrigation and water harvesting methods on its own estates.

Business strategy/supply chain responses: The main business strategy response is to diversify products into macadamia and avocados.

Key issue: Access to finance has impacted the ability to support outgrowers since it is difficult to raise financing as land cannot be used as collateral. Support is needed to implement irrigation schemes.

Conclusion: Climate risks are ranked the highest by the company. The company has made some investments with outgrowers, for example in new planting stock. This is supported by The Tea Research Foundation and the Zimbabwe Tea Growers Association on a commercial basis. The company believes that donor support for dams, water catchment, and R&D is needed.

Annex 2: Questionnaire

Agribusinesses and responses to climate risks

Name / Contact	
Organisation / Title	
Date / Location	
Vuna Participants	
Interview Key Points	
Additional / Reactions	
Follow-up	

QUESTIONS:

1. Company data:

Size: turnover/employees	
Description of business	
Head office and countries	

2. What small-scale farmer programmes or activities are in place?

Nature of relationship	
Average size of farm	
Commodities sourced	
Formal programmes/ activities and/or support	
Number of farmers	

3. We understand that as a result of climate change in this country, temperatures may be rising, rainfall may become more erratic, and droughts may become more frequent. It is possible that as a result of rising temperatures and humidity, insect and plant disease pressures could also increase. There may also be indirect risks such as volatility in prices.

- (a) We would firstly like to know if you face these risks, if you perceive these problems to be important to your business, which specific risks impact on your business and how do these risks have an impact?
- (b) If your firm does face these risks, how does your company respond to the risks in terms of production responses on your own farms and/or with regards to small-scale outgrowers? Are these new responses or are they changes/enhancements of existing responses introduced to cope with climate risks?
- (c) What external support do you receive and what support is needed to improve production responses to any climate risks?

Climate Risk	Description and Impact on the Business	Importance 1 = very important 2 = moderately important 3 = not important	Main Production Response New Response or Change/ Enhancement of Existing Response (include start date of response)	Expected Impact	Any External Support Received and Support Required
DIRECT RISKS					
Increases in temperature					
Changes in rainfall - patterns, timing and intensity (e.g., spread of rainfall, heavy rainfall or fewer events)					
Changing crop seasons (e.g., delayed start; early end)					
Greater insect or disease problems					
Drought					
Flooding					
INDIRECT RISKS (e.g., from droughts elsewhere in the world)					
Greater variability in national prices					
Greater variability in international prices					

Codes for Column 4: new seed varieties = 1; new water management practices = 2; new soil management practices = 3; new fertiliser management practices = 4; changes in planting dates, production timing or land alterations = 5; changes in crops grown = 6; changes in pest management = 7; changes in disease management = 8; changes in farming practices = 9; changes in extension support and/or training provided = 10; use of climate information/early warning systems/changes in monitoring activities = 11; other = 12.

4. What changes in resource allocations, business or trade strategies have been introduced by your firm in order to respond to any climate risks? Are these new responses or are they changes/enhancements of existing responses introduced to cope with climate risks?

Climate Risk	Resource Allocations, Business or Trade Strategies (include start date of response)	Expected Impact	Enabling Environment Issues, External Support Received and Support Required
Increases in temperature			
Changes in rainfall - patterns, timing and intensity (e.g., spread of rainfall, heavy rainfall or fewer events)			
Changing crop seasons (e.g., delayed start; early end)			
Greater insect or disease problems			
Drought			
Flooding			
Greater variability in national prices			
Greater variability in international prices			

Codes for Column 2: diversification of the business = 1; investment in R&D = 2; changes in technical strategies = 3; expansion of catchment for obtaining crop product = 4; expansion of imports of crop product = 5; changes in crop inventories = 6; changes in storage strategies = 7; changes in prices that are paid for crops = 8; changes in payment strategies = 9; changes in financing strategies = 10; changes in financial risk management including hedging strategies = 11; climate related insurance = 12; use of climate forecasting = 13; improvements in monitoring capacity = 14, other = 15.



5. Do you think that your company could face climate risks over the next 20 to 40 years? If so, what types of risks are likely to be faced and are these risks likely to be gradual changes or erratic events? What are the possible responses to these risks that would increase the resilience of value chains?

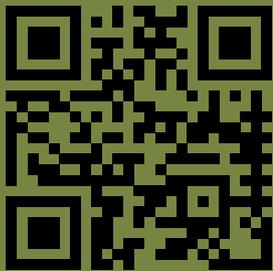
Climate Risk	Description of Anticipated Risks	Potential Strategies, Responses and/or Long-term Solutions
DIRECT RISKS		
Increases in temperature		
Changes in rainfall - patterns, timing and intensity (e.g., spread of rainfall, heavy rainfall or fewer events)		
Changing crop seasons (e.g., delayed start; early end)		
Greater insect or disease problems		
Drought		
Flooding		
INDIRECT RISKS		
Greater variability in national prices		
Greater variability in international prices		



6. Does your business face other key risks, what are these risks and how do they compare to climate risks?

Business Risk	Description	Importance 1 = very important 2 = moderately important 3 = not important	Ranking in Importance 1= highest 2 = 2 nd highest 3 = 3 rd highest 4 = 4 th highest 5 = 5 th highest
Access to finance			
Access to land			
Government policies and regulations			
High taxes and related business costs			
Input supply markets			
Prices for inputs			
Prices for outputs			
Infrastructure challenges			
High transport costs			
Inconsistent commodity supply			
Labour productivity			
Side-selling by outgrowers			
Access to climate information and predictive capacity			
Climate risks			
Other (specify)			





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