 doi:10.20944/preprints202209.0224.v1

Contract Farming and Climate Change Adaptation in Rural Zimbabwe

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Abstract

The literature on contract farming and climate change in Zimbabwe has blind spots in relation to the study of contract farming as a climate change response. While the literature on contract farming and climate change abounds, such literature is lacking when it comes to the exploration of how contract farming can facilitate climate change coping and adaptation strategies by smallholder farmers. This paper fills this gap. It draws on in-depth interviews with 10 contracted and 10 non-contract farmers who were engaged through face-to-face in-depth interviews in the Chipinge South Constituency. It found that contract farming does not only boost productivity, but it also enables farmers to positively respond to the ravages of climate change, and therefore, it should be supported and encouraged. Future research should explore more viable and sustainable way through which the state, instead of private sector actors, should be at the centre of contract farming.

Keywords: Climate change, contract farming, coping, adaptation strategies, Zimbabwe

Introduction

Climate change and its undesirable effects has received sustained scholarly and policy attention in recent years, particularly with regard to how the livelihoods of peasant producers, who are the most vulnerable categories of society, are affected (Antwi-Agyei, Stringer, and Dougill 2014; Borras and Franco, 2018; World Bank 2014). Climate change literature also flags several strategies deployed by peasant producers to cope with and adapt to climate change (Azumah, Donkoh, and Ansah 2016; Laube, Schraven, and Awo 2011). The literature is, however, lacking when it comes to exploring how contract farming can also facilitate climate change coping and adaptation strategies by producers. A number of studies have problematised contract farming as a neoliberal development approach which facilitates primitive accumulation by monopoly capital (Kariuki and Loy 2016; Mazwi, Tekwa, Chambati, and Mudimu 2018; Ndhlovu, 2021, 2022a). However, focusing on poor-resourced farmers, this study takes a different viewpoint of contract farming, and explores it potential as a climate change coping and adaptation strategy. The study is set in the Chipinge South Constituency in south-eastern Zimbabwe.

In recent years, Chipinge South has become an area characterised by cyclones, high temperatures, droughts, pests and diseases as a result of climate change (Mavhura et al 2017; Mutero and Mutekwa 2018). Households in this area, most of whom peasant producers, have adopted some coping and adaptation strategies arrangements to reduce the impacts of changing climatic conditions on the agriculture activities. The IPCC (2014) defines climate change adaptation as "the process of adjustment to actual or expected climate and its effects; in human systems, adaptation seeks to moderate harm or exploit beneficial opportunities; in natural systems, human intervention may facilitate adjustment to expected climate and its effects" (quoted in Azumah et al 2016:2276). It involves making adjustments in anticipation of or in response to internal risks that accompany climatic changes (Muzamhindo, Mtabheni, Jiri, Mwakiwa, Hanyani-Mlambo 2015). In the Chipinge South Constituency, consciously and or

 doi:10.20944/preprints202209.0224.v1

unconsciously, a number of climate coping and adaptation strategies already exist as households defend their livelihoods steeped in agricultural activities. However, the diagnostic potential of contract farming as a climate change coping and adaptation strategy remains unexplored. On the other hand, the available literature on contract farming largely focus on productivity and livelihoods as well as the political economy that emerges with contract farming. For instance, Chambati et al (2018) explored contract farming and peasant livelihoods; Sakata (2017) explored the role of international companies in contract farming; Masakure and Henson (2005) examined why farmers would prefer to produce under contract; and Mazwi, Chemura, Mudimu, and Chambati (2019) explored the political economy of a State-led contract farming model. Surprisingly, none of these studies considered contract farming as a noteworthy actor to climate change coping. This is the gap filled by this study.

In the next section, literature on both contract farming and climate change is reviewed so as to contextualise the study. This is followed by a description of the materials and methodology for the study. Thereafter, the results are presented and the discussion made concurrently. Lastly, a discussion on the implications of the results is made as part of the conclusion.

Agriculture, Climate Change and Economic Partnerships

Agriculture is a source of livelihoods for more than 70% of households in Sub-Saharan Africa (Moyo 2016; Ndhlovu, 2021, 2022b). The number of the economically active in agriculture in Africa increased from 100 million in 1980 to 212 million people in 2013, notwithstanding the decline in the share of the people working in agriculture from 71.8 to 57.2% during the same period (ILO 2014). In Zimbabwe 70% of the population lives in the rural areas where land-related activities are the major source of survival (World Bank 2017). The agricultural sector also contributes about 16% to the Gross Domestic Product (GDP) in that country (Muchetu 2018; Ndhlovu, 2021). Thus, agriculture is a key source of survival which cannot be allowed to fail. In the context of a broad-based economic crisis that has rendered the Zimbabwe unable to support its vulnerable peasant producers, the government has endorsed the participation of public and private actors in the agriculture sector (Government of Zimbabwe 2018). Such partnerships include contract farming, joint ventures, and partnerships, among others.

Contract farming is an agreement with sets of conditions in the production and marketing of the commodity between producers and a buyer (Food and Agricultural Organisation (FAO) 2012). The major advocate of contract farming, the FAO, considers contract farming as a win-win plan and a poverty reduction tool with the potential to reverse years of agrarian stagnation through technology transfer and enhanced access to input and output markets (FAO 2012). The World Bank (2007) views contract farming as a remedy to Africa's development dilemma as it links farmers to more lucrative regional and international markets. It is, however, paradoxical that even the advocates of contract farming are also silent on its diagnostic potential as a climate change coping strategy.

There are two ways in which contract farming can be adopted as a climate change coping and adaptation mechanism: first, contracting may provide farmers with adequate and improved inputs (seeds, fertilizers, and chemicals, among others) that are climate-specific so as to boost or sustain productivity. This consequently boosts farmers' capacity to cope with the negative effects of climate changes. For instance, climate change can lead to the emergence of new crop diseases and pests which threaten production. Farmers who are contracted may be supplied with agri-chemicals to control crops diseases and insects and, thus, minimise the

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impact on yield (Chambati, Mazwi, and Mberi 2017). Contracted farmers can also receive inputs or advice on disease- and insect-tolerant crop varieties that can help minimise losses, thereby, reducing climate exposures (Kariuki and Loy 2016). Second, contracting may assure farmers of the market for their produce. Such assurance could motivate farmers to adopt strategies that overcome climatic challenges and improve yield. According to Azumah et al (2016), contracting provides price certainty, particularly to risk-averse farmers.

In Zimbabwe, climate change literature has been increasing in recent years (Brazier 2017; Chanza 2018; Jiri and Mafongoya 2018; Jiri, Mafongoya, and Chivenge 2017; Muzamhindo et al 2015; Mwadzingeni, Mugandani, and Mafongoya 2021; Nangombe, Madyiwa, and Wang 2016). Likewise, contract farming literature abounds particularly since the land reforms that were implemented in the 2000s. The climate change literature available has been focusing on detailing the strategies being used to respond to climate change. These strategies are both national and micro-level. At the national level, the state is responding through initiating and expanding irrigated agricultural activities across the country, crop development, and specialisation, as well as improved technology use (Brazier 2017). At the micro-level, Zimbabwe peasants have been noted to mostly use to both on-farm and off-farm strategies to mitigate the effects of climate change (Jiri and Mafongoya 2018).

What, however, emerges in the climate change and contract farming literature strands is that climate change affects productivity and that contract farming can boost production. This silent observation compares with a number of studies elsewhere. In Vietnam, Saenger, Qaim, Torero, and Viceisza (2013) found that even under adverse climatic conditions, well-designed contract farming with incentives enabled farmers to produce high-quality milk products, especially where bonus payments were also extended. Freguin-Gresh, d'Haese, and Anseeuw (2012) found that in South Africa, contract farming improved agricultural output and incomes through offering farmers better access to resources and services while at the same time creating opportunities for farmers to participate in markets. In India, Ramaswami, Birthal, and Joshi (2009), found that contracting offered a win–win situation for both broiler growers and poultry integrators. In Ghana, Wuepper and Sauer (2016) found that contract farmers were more resilient to climate change variability than their non-contracted counterparts. In all the studies described here, however, there has not been any attempt to link contract farming to climate change adaptation.

South-eastern Zimbabwe has many important features that make it an ideal setting for the study of the potential link between contract farming and climate change. The region has agriculture as the key livelihoods strategy (Ndhlovu 2020a) and yet it is one of the most drought-prone regions in the country (Mugandani, Makarau, and Chipindu (2012). Droughts in this region are experienced in the greater part of a typical production year. Empirical investigations show that in south-eastern Zimbabwe, poverty remains high particularly among women, most of which are farmers (Mutero and Mutekwa 2018). Among the key factors that have exacerbated poverty in the region is vulnerability to climate change (Mudzengi et al. 2021).

While climate change has been going on for years, the cumulative effects on Zimbabwe have become more pronounced in recent decades. The Meteorological Department in Zimbabwe reveals that there are changes in terms of rainfall patterns, first day of rain start, occurrence of dry spells, rainfall intensity, and rainfall amounts. Flood and cyclone occurrences have also become more frequent. In recent decades, these included cyclone Bonita (1996); Eline (2000); Japheth (2003), and Idai (2019), among others. The severe seasonal variations in

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rainfall and temperature due to climate change expose farmers to intense production risks. Considering that most households operate under rain-fed agriculture (Muzamhindo et al., 2015), rainfall and temperature variations have austere implications on production and livelihoods means.

The high rainfall variability, unreliability, and uncertainty have stimulated farming communities to adopt measures to cope and adapt to dynamic climatic, environmental and weather conditions. This has helped them to mitigate the adverse farming effects associated with climate variations. While most of the measures adopted are traditional and subsistence, in recent years, contract farming has also been accepted. The commonest form of contract farming available to smallholder farmers in south-eastern Zimbabwe involves the provision of production inputs to the farmers, who in turn pay for the cost of these inputs either in kind or in cash at the end of the production season. The major contractors are the private sector and the state.

Private sector marketing agencies, such as the Cotton Company of Zimbabwe (Cottco), Cargil, and Parrogate engage in contracts with farmers who grow cotton. They provide inputs, packaging, transportation, and also, in some instances, technical support to farmers. The state, on the other hand, at one time, contracted farmers through its Special Maize Programme for Import Substitution (SMPIS) also known as Command Agriculture. The initiative was funded through a public-private partnership between the government and its private partners. The role of the private partners was to provide capital and to coordinate the marketing of produce, including exporting, sharing of best practices and farming knowledge, and transfer of expertise through farmers training while the role of the government was to provide an enabling environment and oversee the whole process (Odunze and Uwizeyimana 2019). The SMPIS commenced in October 2016 and was rolled out for three consecutive planting seasons.

With the expiration of the SMPIS, some farmers were also contracted under the *Pfumvudza/Intwasa* which also focus on the production of grains. While the participation of private agencies saw an increase in both tobacco and cotton production (Mazwi et al., 2018; Svotwa and Mapfumo 2015), the SMPIS and the *Pfumvudza/Intwasa* also resulted in bountiful maize production (Mhlanga and Ndhlovu 2021; Odunze and Uwizeyimana 2019). For the first time since the radicalised land reform in 2000, Zimbabwe experienced a major decrease in grain imports following the bountiful harvest of the 2016/2017 season under the SMPIS. The import expenditure for maize dropped by 86% in 2017 (Zimbabwe Vulnerability Assessment Committee (ZimVAC), 2020). This justifies the postulation by Kariuki and Loy (2016) that contract farming can be a source of important knowledge that can improve the overall productivity and income gains from the farming. Contractual arrangements can also boost smallholder farmers' aptitude to adopt climate change coping and adaptation strategies.

Despite the potential of contract farming as climate change coping and adaptation strategy, critics of contract farming contend that the model is built on uneven power-relations between agri-business and the farmer, resulting in the exploitation of the peasantry (through extraction of surplus value and working beyond normal hours) (Ndhlovu, 2022b; Shivji 1992). Chambati et al (2018:2) aver that the model "turns farmers into propertied 'proletariats' 'wageworkers' due to the perceived lack of autonomy and the persistence of indebtedness among small-scale farmers." Some argue that contract farming is less likely to target resource poor rural farming communities, and that it is hardly feasible that the arrangement can be a viable strategy for rural development (Svotwa and Mapfumo 2015). However, this study explores the potential of contract farming as a climate change coping strategy.

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Materials and Methods

Characterisation of the study area

The study was conducted in Chipinge South Constituency in Manicaland Province. The Constituency borders Mozambique to the east and south, and borders the Chiredzi District to the west. This Constituency comprises of 12 wards, namely; wards 20 to 30 as well as ward 16. It covers approximately 5 393km^2. Much of the area lies in the valley and the area is mostly arid and is in Natural Region V according to the agro-ecological classifications of Zimbabwe. The area is characterised by low rainfall, poor soils with low agricultural potential and high temperatures (Mugandani, et al., 2012). It is characterised by a tropical savannah climate. The average monthly maximum temperatures are 25.9^{o}C in July and 36^{o}C in January while minimum temperatures range between 9^{o}C in June and 24^{o}C in January. Annual average rainfall is ranges from 400 to 600mm. The area is defined by drought-resistant vegetation, mainly, the acacia, baobab, and Mopani, which are typical of low-veld trees in Zimbabwe. The area is inhabited by the Ndau (a Shona dialect) in the northern part and by the Hlengwe (a 'Shangane' dialect) further south, beginning in Mutandahwe village until Mahenye village. Recurring droughts expose households in the area to hunger and starvation with the most vulnerable members of the population being the poor, marginalised, women, children and the elderly (Mutero and Mutekwa 2018).

The major livelihood source for the residents is subsistence crop and livestock production which, however, is heavily constrained by aridity. The main food crops cultivated are sorghum and maize while cotton, sunflower, and sesame are grown for sale. The livestock reared include cattle, goats, donkeys, sheep, and poultry (Mudzengi, Gandiwa, Muboko, Mutanga, and Chiutsi 2021). Households in the area also practice community gardening and run irrigation schemes, and sell produce to each other and also to other interested buyers. However, because much of the area relies on rain-fed subsistence agriculture, it is very vulnerable to climate change.

Sampling Technique and Data

This study deployed a case study approach to examine the capacity of contract farming as a climate change coping and adaptation strategy with a focus on smallholder producers. The Chipinge South Constituency was chosen based on its rural nature and its intense agricultural activities. Time and budgetary constraints made an intensive case study of one constituency a suitable method for data gathering, rather than covering a wider area more thinly. The population of the study was defined as all the households in the 12 wards that make this constituency. The household was the unit of analysis. Data was collected between October 2021 and January 2022. A total of 20 farmers were selected from wards 27, 28, and 29. The wards were selected based on accessibility.

Data was collected using in-depth face-to-face interviews. The interviews sought information on how contracted households responded to climate change challenges, namely; changes in: rainfall patterns; rainfall start days; rainfall and run-off intensity; rainfall amounts; occurrences of dry spells, emergence of new crop diseases; and emergence or increasing occurrences of crop pests. These variables were identified based on reviewed literature which revealed that with regards to farming communities, climate change and its impact is often observed through such aspects (Jiri et al. 2017; Mutero and Mutekwa 2018; Nhara, Halimani,

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and Masunda 2020). The study also gathered data on perception of the link between contract farming and the various climate change challenges which farmers experienced.

Of the 20 farmers, 12 were men while the other 8 were women who were selected purposively. Farmers, who consented to participation, were selected based on whether they were (i) contracted either by the State or private marketing agencies; (ii) contracted member in the family; and (iii) whether they were not contracted. A total of 10 farmers were contracted. Seven farmers were contracted to marketing agencies, namely; the Cottco, Cargil, and Parrogate for cotton. One farmer was once under the SMPIS, while two farmers were under the *Pfumvudza/Intwasa* initiative. Another 10 farmers were not contracted. The inclusion of both contract and non-contract farmers was to enable for a balanced view on the impact of contract framing as a climate change coping and adaptation strategy. Interviews were assigned numbers from 1 to 20 to enable reference in the write-up.

Results and Discussion

The focus of this study was to examine how contract farming could serve as a climate change coping and adaptation strategy by crop farmers in south-eastern Zimbabwe. The results of the study are detailed in the following sub-sections.

Farmers' background information

Majority of the farmers were male (12 farmers) while 8 were women. The researcher also observed that farmers were generally elderly, possibly over 50 years all of them. The researcher did not however, follow up with farmers to confirm this observation. A total of 11 farmers had no formal education while only two had farming-related training. This could confirm the study by Ndhlovu (2020a) that the young, both educated and less educated members migrated from the countryside in south-east Zimbabwe, to urban areas, particularly towards South Africa.

A total of 15 farmers had cotton as their major crop. They mentioned that cotton was more lucrative than sunflower, sesame, and even grain crops. Most of these farmers grew cotton on more than two hectares of their land. A total of seven were contracted by cotton agencies. The minimum number of cotton bells which each participant reported to have harvested was 8 bells. One farmer was once under the SMPIS, but was no longer contracted because the facility was discontinued. A total of two farmers were under the *Pfumvudza/Intwasa* initiative. The other 10 farmers were not contracted at all although some also grew cotton. All farmers reported that they relied mostly on family labour for farm work. All farmers had over 10 years of farming experience. Lastly, farmers reported that they had access to extension support.

Perceptions about climate change effects

Farmers were requested to indicate their perceptions on how climate change is unfolding in the Constituency. Farmers were also requested to indicate the perceived impact of climate change on their farming activities. This was meant to generate an understanding of the gravity of the impact of climate change on production. Farmers indicated that climate change manifested in the area through: significant changes in rainfall patterns particularly since the early 1990s (Interview 7, 2021). Rainfall start days were reported to have significantly changed. Rainfall could sometimes start to early or too late, thereby making land preparation a gambling, and that farming season was now very distorted. A participant revealed that:

> A whole lot have changed. You cannot know when exactly to expect rains. It used to start around October. That has changed. Now it comes around December or even January.

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> Sometimes it rains from October to December, and then it never rains again. This means crops will wilt. You cannot pinpoint the exact farming season anymore. From time to time, there are prolonged dry spells. You have to rely on the media as to when rainfall is likely to start (Interview 4, 2021).

Farmers also reported that rainfall amounts had become a problem. One participant mentioned that:

> If rain starts very early, then there is a big problem. It will be so much and can take days that you will be able to leave your houses. Streams and rivers will be full and part of the fields are swept away. Run-off will be so high (Interview 11, 2021).

Due to increasing temperatures, evapotranspiration, was reported to be very high. Another participant detailed this situation in the following words:

> It has also been hot in recent years. We are told that temperatures are getting to around 40^{o}C particular in the month of October which is now as the suicide month here in Lowveld. If it rains, after two-three days you won't know it rained except in the *tsobolo* areas. In the *thlaba* fields, you will see whirl-winds as it did not even rain (Interview 9, 2021).

Farmers also reported of increased storm and cyclone incidences which were not very common before. Since the 1990s, a number of storms and cyclones, including cyclone Bonita 1996; Eline 2000; Japheth 2003, and Idai in 2019, among others, had ravaged the area, leading to loss of crops and livestock. Farmers also mentioned that climate change in the area also manifested through the emergence of new crop diseases and emergence or increasing occurrences of crop pests.

Most of the farmers agreed that climate change was increasing and was showing no signs of decline in the area. While some farmers had hope that climate conditions could be improved by being responsible, others simply accepted it as an act of providence which needed to be accepted. One participant indicated that:

> These climate conditions will not improve. It nature. You cannot change nature. It is God who is doing it and no one will change it. We have to live with it. Coping and adapting is the only best way to go. What matters now is the resources to cope with it (Interview 5, 2021).

All farmers agreed that their farming activities were being affected by changing climate conditions. This finding confirms previous studies in the area which found that the Chipinge South Constituency was increasingly becoming very susceptible to droughts; and therefore, rain-fed agriculture for livelihoods was no longer not sustainable (Mavhura et al 2017; Mutero and Mutekwa 2018). Mutambara and Mutambara (2014) and Mutero and Mutekwa (2018) also found in the south-eastern region in Zimbabwe, precipitation has significantly decreased, while temperatures and evapotranspiration have increased.

The study also found that climate change had significantly complicated livelihoods strategies in the Constituency. Farmers mentioned that due to climate change, households were now recording low crop yields, particularly for maize which cannot stand harsh climatic conditions. A participant mentioned that:

> The production of food crops, especially maize, is now a challenge here. Maize, especially the varieties that are suitable for this area, does not stand very hot temperatures. As a result, the yields are going down every year. This explains why some now grow sorghum for food. With sorghum, you have a good chance. You also see most people also growing

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> cotton. Cotton can survive these temperatures. So, people grow cotton and with the more they get, they buy food and meet other household needs (Interview 11, 2021).

With the majority of the households in the area relying on agriculture, sustainable interventions are needed urgently. What comes to the surface though is that households lack adequate resources on their own to respond to this change. Responding to climate change sometimes requires research and innovation, use of particularly infrastructure, and use of specific agriculture inputs which might be expensive or difficult to access.

Climate change and contract farming coping and adaptation strategies

The most practiced coping and adaptation strategies by participants was the use of climate-related seed and the use of spraying chemicals to kill insects and control diseases. Seed is the basis of scientific agriculture. It is the basic input and the most vital catalyst for other inputs to be cost effective (Mariga 1994). Contracted farmers revealed that they received seed that was suitable for their climatic conditions from contractors. One participant mentioned that:

> The contractors are now aware of the harsh climatic conditions here. In recent years we now receive seed varieties that can survive with little moisture. This is enabled us to work with confidence. We have also stared to harvest more than before (Interview 7, 2021).

Another participant who once was contracted to Command Agriculture mentioned that:

> We were provided with the seed by the Seed Company of Zimbabwe. The seed tolerates heat and drought, both of which are a known problem in this areas and the rest of the lowveld. There also are some who got drought-resistant sorghum seed from the National Breweries (Interview 15, 2021).

The provision of seed enabled farmers to use high quality seed with known performance. Seed provision also enabled farmers to increase the size of cultivated land as overall input cost falls. Non-contract farmers also used improved seed varieties which they bought for themselves. While some of them considered their non-contract status as advantageous as they had the freedom to sell their produce to anyone whom they wanted, some reported that they were struggling to operate without support. One non-contract farmer mentioned that:

> Those who are contracted worry less about inputs. They know they are covered in terms of good seed. The concentrate on the work. On the other hand, we have to worry about all these things. We spend tie running around to get inputs. By the time we come back, they have already planted. They are always ahead (Interview 12, 2021).

Contractors also provided training on how to plant and look after the improved to their member farmers. This enabled farmers to perform better than their non-contract counterparts. One contracted maize farmer revealed that:

> We were provided with training of how the maize seed that were received should be grown. We were instructed that the field should always be clear of weed so that crops and weeds do not compete for nutrients (Interview 15, 2021).

Cotton farmers also indicated that they received training on how to plant, use chemicals, and how to prepare the lint for the market. The non-contract farmers confirmed that they did not receive any training. It was also observed that the government extension services were not popular in most of the villages. The only extension worker for all the case study wards was based in the Mtandahwe village, and all participants complained that he was mostly biased

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towards supporting irrigation members and cotton farmers. This left non-contract farmers without reliable extension support.

The other strategy was the use of spraying chemicals. Climate change often provides favourable conditions for the growth and survival of some destructive inserts and weeds. Connor (2008) found that climate change often promoted insert and disease production. Where inserts and crop diseases abound, crop production is negatively impacted. Thus, the use of chemicals enables farmers to minimize the damage. Azumah et al. (2016) found that rising levels of carbon dioxide due to climate change increased the number of leaf-eating insects. Farmers mentioned that even those farmers who were not contracted also used spraying chemicals to increase output. A participant mentioned that:

> It is difficult to avoid using chemicals, especially on cotton. Even if you are not under contract, you have to make a plan to get chemicals otherwise you will harvest nothing. If you do not spray all the crop diseases and inserts will breed in your field and you suffer loss. Neighbours will also blame you for breeding diseases and inserts (Interview 19, 2022).

Non-contract farmers also confirmed the chemical acquisition challenges of operating without a contract. A farmer mentioned that:

> By the time we come back, the crops have been destroyed by inserts or by diseases. So, contract have its own challenges, but it is somehow working. I did not take it because my husband does not want it. He says it is exploitative (Interview 16, 2022).

Non-contract farmers revealed that their harvest was always low as a result of pests, crop diseases, and their lack of adequate inputs. They also mentioned that the situation had been made worse by unpredictable climate change. One non-contract farmer mentioned that:

> I used to get over 15 cotton bells on my field. It is getting too hot and sometimes that rains come late, if at all. If without support from these companies: Cottco, etc., it is worse. Operating without support is challenging. However, the companies are too selective. I defaulted last time and they could not consider me this time. Without enough chemicals, the harvest is always low (Interview 7, 2021).

Cotton was the key crop associated with the spraying of chemicals due to the many diseases and inserts that attack it. However, although chemical use has a positive effect on cotton revenue, it can also increase climate change-related problems. This view was supported by one participant who recommended that:

> Training is needed for farmers because chemicals destroy the ecosystem. Most of the farmers do not have training on crop production. Simple training such as pest scouting and determining of threshold insect population is needed, and yet overuse of chemicals can destroy plants. pollute water bodies, and thus, worsen climate change. This will enable them to judge whether they should spray at a particular point so as to avoid over application of chemicals in the environment. Such training would ensure that farmers only accept what is basic from contractors and thus, avoid unnecessary expenses (Interview 13, 2021).

What also emerged is that most farmers emphasised how the use of chemicals enabled them to harvest more while actually not taking into account the full costs of chemicals on issues, such as health costs to the farmers and the community and the potential damage to the ecosystem. Chemicals were, however, mostly used in cotton production and never on grain crops. All the farmers mentioned that they did not use chemicals for maize for which they had been contracted.

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For farmers who produced grain crops, particularly maize, sowing in rows, mixed farming, mixed cropping, and crop rotation were the main coping and adaptation strategies. Sowing in rows enabled farmers to increase crop density per unit area. This was mainly practiced by farmers who were contracted to the state through its *Pfumvudza/Intwasa* initiative. This initiative is a crop production intensification mechanism under which farmers ensure the efficient use of resources (inputs and labour) on a small area of land so as to optimise its management. The concept was developed by the Foundation of Farming - a local non-governmental organisation – in an effort to meet cereal needs for an average household of six members over one year from a small piece of land. It is based on three core principles, namely; minimum soil disturbance or tillage; digging holes for planting only, permanent soil cover by using organic mulch; crop rotations and intercropping cover crops with main crops. Household food security is expected to be achieved when activities are done on time, at standard, without wastage, to the expected precision and with joy (Mujere 2021). Sowing in rows was considered as effective by most farmers one of whom revealed that:

> This type of planting has indeed improved yields. Even households that are not part of *Pfumvudza* are now practising it. When I was first recruited, I was negative about it because of the amount of labour involved. My attitude changed when I saw what it actually does. The small piece of land that I committed to this practice gave me much than I usually get (Interview 14, 2021).

Some participants revealed that even those households that were not part of *Pfumvudza* were now practising it due to is favourable results. The effectiveness of sowing in rows under *Pfumvudza* in this constituency compares with national findings. At the national level, it was found that farmers who had adhered to the recommended *Pfumvudza* practices of full mulch cover, fertilizer application levels, timely crop planting, crop spacing, optimal plant populations, pest and disease management achieved almost 800% more yields as compared to conventional farming using ox-drawn ploughs (Mujere 2021). One participant mentioned that:

> I normally get between 10 and 15 bags of grains from the same size of cropped land. However, with this programme, I got more. I harvested 19 bags. My neighbour got about 25 bags. This is amazing. The more you adhere, the more you get. I wish if all households could be enrolled for this programme (Interview 15, 2021).

However, it was mentioned that because most households were not included in the programme in the constituency, they only practiced it in family and cooperative gardens, contributing less to climate change mitigation. Farmers, however, mentioned that production in the constituency is mainly rain-fed. As a result, since maize is not drought-resistant, they also practiced mixed cropping whereby they grew a variety of crops to minimise lost as a result of unpredictable climate outrages. this enabled them to cope with the adverse of effects of low productivity due to low rainfalls or other climate change impacts. One participant mentioned that:

> This area is notable for its rich soils. However, the problem is the climate. In recent years, things have been getting worse. Some years the rains come while some years it does not. Maize need enough water. So, if you plant maize alone, if the rain is not enough, then you are in a big problem. As a result, we diversify. We plant a variety of crops (Interview 8, 2021).

In view of the quotation above, mixed cropping is also a way of diversifying crop productivity in this constituency so that if one crop fails because of harsh climatic conditions, other crops may survive and therefore provide alternative livelihoods for households. Some farmers also

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mentioned that sorghum and cassava usually endured the cyclones that have been frequenting the area in recent years. Thus, they preferred to allocate larger land pieces to these crops than maize. This was particularly the case in the Maparadze and Chikono communities.

The least practiced coping strategies by crop farmers in constituency was irrigation. Although they emphasised its importance, many of them indicated that they did not have access to it. Only two farmers mentioned that they used irrigation. When these were probed, it was found that they were members in the only two irrigation schemes in the areas, namely Ruva Raabuda and Vimbanai irrigation schemes. Farmers mentioned that households in Chinyamukwakwa, however, had access to irrigation facilities from the nearby Chisumbanje Ethanol project. However, this is only limited to a few plots that were allocated to them when their lands were expropriated by the same project. All participant farmers practiced mixed farming, that is, they grew crops and also raised livestock. They mentioned that this enabled them to survive crop failure as the livestock could be sold for cash needed to meet basic household needed.

Another coping strategy used by farmers was organic fertilizer application. This method was practiced along *Pfumvudza*. In this method, holes were dug and filled with animal manure before throwing in the seed. This increased soil fertility and also assisted in retaining soil moisture. *Pfumvudza* was mainly mentioned for maize production and not cotton.

It was also found that contract farmers were much more resilient to climate change impacts than the non-contract farmer. In this view, although a neoliberal approach (Ndhlovu, 2022b), contract farming has the potential to help resource-poor farmers cope and adapt to climate change variability. It was found that contract farmers generally had better and reliable access to inputs. Contract farmers also received extension training which enabled them to easily adopt adaptation measures that mitigated the effects of climate change. The training received by farmers from their contractors, compared with the non-contracting farmers, helped them to make crucial and informed decisions in relation to climate change adaptation and coping. The training also helped farmers to allocate resources efficiently and thus, minimise expenditure.

Furthermore, contract farming afforded farmers the opportunity to use improved inputs which formed part of the contractual agreement. The inputs were being delivered to farmers by their contractors, and thus, farmers did not have to spend time looking for inputs. The use of improved inputs enhanced farmer resilience to adaptation. This view confirms Azumah et al (2016) who found in Ghana that farmers contracted farmers stood a better chance of adapting to climate change than their non-contracted counterparts. To avoid defaults, contractors now offer support in form of inputs and not in cash. This enables farmers to focus on creating conducive conditions to ensure that they can harvest more to repay the contractors while also making a profit. The support provided by contractors enabled farmers to minimise the potential crop losses resulting from climate change. Thus, contract farming did not only help in dealing in climate change challenges, but also the livelihoods of farmers.

What also emerged from the data was that in addition to contract farming, extension services, family size, size of field, experience, and gender were important aspects which enabled farmers to effectively adopt climate change strategies. Farmers who had access to extension services, large households, and those with more experience mostly reported to be performing better. Issues of age, education, and off-farm activities were also important in enabling farmers to positively adopt climate change strategies. It was also observed that farmers who reported enough access to extension support also happened to be performing better in terms of output. They also had more knowledge of climate change and coping strategies than

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those who reported inadequate extension support access. It can, therefore, be posited that farmers who had more extension support also happened to adopt more climate change coping and adaptation strategies. It was also observed that cotton farmers adopted more coping and adaptation strategies than maize farmers. In fact, not even one of the maize farmers reported that they used spraying chemicals. Male farmers participated more in coping strategies. This can be possibly explained by the fact that cotton spraying was manual and, therefore, hard labour. As a result, it was mostly done by men. Farmers with large fields also adopted coping and adaptation strategies more than those with small-sized fields. Participants revealed that these farmers usually harvested more all the time and, therefore, have the financial ability to adopt soil and water conservation measures on their lands. It was also found that long years of diversification also translated to the adoption of more strategies to reduce the negative effects of climate change, both in the short and long terms.

It was also found that contracting did not necessarily translate to the automatic adoption of climate change coping and adaptation strategies. In actual fact, the potential of contract farming to offer coping strategies depended on the preferences and perceptions of farmers. For instance, some farmers objected the use of chemicals as a viable response to climate-related challenges arguing that chemicals damaged soil fertility. Thus, although contracted and provided with chemicals, such farmers to use the chemicals sparingly, hence remaining susceptible to the ravage of pests and diseases that could have emerged due to climate change.

Conclusion

Farmers in the Chipinge South Constituency responded to the effects of climate change in a number of ways, including use of spray chemicals, mixed cropping, row planting, mixed farming, and crop rotation. It was generally believed that contract farming enabled farmers to respond to climate more readily and more positively. Contract farming facilitated and promoted the adoption of climate change coping and adaptation strategies by farmers, and those who implemented more adaptation strategies often produced more. Non-contract farmers also confirmed that they would perform better if contracted. It can, therefore, be concluded that contract farming is an important climate change coping and adaptation strategy in this constituency. It does not only boost productivity, but also enables farmers to positively respond to the ravages of climate change and improve their accumulation and livelihoods. Therefore, instead of dismissing it as neoliberal approach, future research should closely examine contract farming to determine its potential impact on climate change responses by farmers as this study shows that it increases the effectiveness at which farmers cope with or adapt to climate change.

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