Social Sciences & Humanities Open 7 (2023) 100482

Contents lists available at ScienceDirect

Social Sciences & Humanities Open

journal homepage: www.sciencedirect.com/journal/social-sciences-and-humanities-open

Regular Article

Analysis of strengths and weaknesses of land reform farms of diverse farmers and uses in the Waterberg District, South Africa

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ARTICLE INFO

Keywords:
Constraints
Farmers' social class
Farmer support
Land use activities
SWOT analysis

ABSTRACT

In this study, we aimed to analyse the strengths and weaknesses of land reform (LR) farms ('farm issues') because the lack of understanding of these issues could partly be the cause of limited livelihood gains from these farms. Furthermore, the examination of these issues provided specific recommendations to each group of farms, which could improve LR farmers' livelihood gains. We investigated 50 LR farms in the Waterberg District Municipality (WDM), Limpopo Province, in South Africa. A survey was conducted, literature about the consequences of climate change and prospects for financial support from the state was reviewed, and a stakeholder workshop was organised. We used Fisher-Freeman-Halton exact test to analyse survey data and conducted strengths, weaknesses, opportunities and threats (SWOT) analysis to explore strategic issues. Farms were classified into 3 groups based on their SWOT issues: A-better-off farms dominated by extensive land uses (n = 22), B- better-off farms dominated by intensive land uses (n = 24), and C- poor farms dominated by either extensive or intensive uses (n = 4). Farmers' social class, conditions of farm physical capital endowment, and the characteristics of the land use activities determined the strengths and weaknesses of LR farms. Strengths of group A farms were good physical capital and less external financial support requirements, and weaknesses were that partnerships were unlikely and family labour was costly. The distinct strength of group B farms was that partnerships were likely, and their high need for external financial support was a distinct weakness. Group C farms had distinct strengths in that family labour was cheap, and insufficient physical capital was their weakness. Acknowledging the diversity in strengths and weaknesses of farms is essential for land reform to play a critical role in rural development. We envisage that financial support from the state, will yield improved production in poor farms. Private investors will yield high production in the better-off farms only if farmers adopt climate-smart agricultural practices.

1. Introduction

In South Africa, like in many other countries implementing land reform, the political leadership aims to address inequalities in land ownership and access and to mitigate the 'triple challenges' of inequalities in household income, unemployment, and poverty (Binswanger-Mkhize et al., 2009; Borras Jr. et al., 2007; Diniz et al., 2013; DLA, 1997; Moyo, 2011; Vista et al., 2012; World Bank, 2018). According to the 'White Paper on South African Land Policy', the attainment of these aims is anticipated to "redress the injustices of apartheid, foster national reconciliation and stability, and underpin economic growth" (DLA, 1997:7). In South Africa, land reform has three components which are: restitution, redistribution and tenure reform programmes (DLA, 1997). Restitution gives land back to people who were dispossessed of it because of racial discrimination for use at their discretion. Redistribution acquires land for those who were racially prohibited access and ownership when they meet set criteria. Only uses approved by the state exist in redistributed land. Tenure secures the land rights of the historically disadvantaged by ensuring that such rights are legalised. Land reform farms result from the implementation of restitution and redistribution; hence these components are prioritised. Restitution has been the same since the inception of land reform in 1996,

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https://doi.org/10.1016/j.ssaho.2023.100482
Received 20 May 2022; Received in revised form 5 February 2023; Accepted 12 March 2023
Available online 23 March 2023

whereas redistribution has different models because it changes with time based on perceived national needs. Restitution and the earlier redistribution model settlement/land acquisition grant (SLAG; implemented from 1995 to 2000) serve mainly the aim of equitable land ownership and access (DLA, 1997). The later models of land redistribution for agriculture development (LRAD; implemented from 2001 to 2010) and proactive land acquisition strategy (PLAS; implemented from 2006 to date) serve mainly to address the triple challenges by ensuring that reformed land is used (DLA, 2006; DRDLR, 2013; MALA, 2001). The above South African land reform sub-programmes, origins of farms owned by the disadvantaged, were accompanied by subsequent post-settlement support packages: 'Comprehensive Agricultural Support Programme/CASP and Recapitalisation and Development Programme/RADP). CASP started in 2004 as a programme within the Department of Agriculture (DoA, 2005). It was intended to provide holistic on-farm and off-farm support to small-scale and emerging farmers, mainly those who benefited from land reform, to ensure agricultural development. The Department of Rural Development and Land Reform introduced RADP in 2009 to provide 'distressed' land reform farms with capital (DRDLR, 2011). The capital support provided ranged from farm infrastructure and machinery (e.g. fencing, cattle kraals, sheds, tractors, pack houses, among others) to production inputs (e.g. seeds, fertilisers, breeding stock, livestock feed, among others). These support programmes partially met their objectives as most of the land reform farms contributed poorly to the lives of the new landowners (Aliber & Cousins, 2013; Antwi & Oladele, 2013; Bradstock, 2005; Lahiff et al., 2008; Valente, 2011).

Studies about land reform farms in South Africa have focused on constraints, looking at relatively few farms either across land reform programmes or within a programme (Aliber & Cousins, 2013; Antwi & Oladele, 2013; Bradstock, 2005; Lahiff et al., 2008; Valente, 2011; Wegerif, 2004). Constraints cited the most in the literature were: organisational challenges, inadequate participation of those who received land, preference for large-scale commercial production, beneficiaries' lack of knowledge and skills, and insufficient post-settlement support (Aliber & Cousins, 2013; Binswanger-Mkhize, 2014; Lahiff & Li, 2012; Valente, 2011). The last three challenges were reported to apply to most land reform farms. In contrast, the first two were reported in restitution and settlement/land acquisition grant farms because households in groups owned these farms. In addition, the preference for large-scale commercial production was said to cause only a few households can participate in land reform. The literature cited above did not consider the farming systems' perspective when assessing constraints in land reform farms. For land reform farms in the Waterberg District Municipality, Netshipale et al. (2022) classified the farming systems. An assessment of the interrelations between constraints and farming systems could enhance our understanding of the causes of limited livelihood contributions from land reform farms.

Analysing strengths, weaknesses, opportunities, and threats (SWOT) is a way to study constraints systemically (Chermack & Kasshanna, 2007; Gürel & Tat, 2017; Leigh, 2006). Moreover, to our knowledge, no studies have analysed constraints in land reform farms from a farming systems perspective. Literature shows that diverse farmers and land use activities likely have diverse strengths and weaknesses (Guarín et al., 2020; Kuivanen et al., 2016; Senthilkumar et al., 2009; Zantsi et al., 2021). Insight into such strengths and weaknesses will contribute to the identification of development pathways for each group of farms. This insight could lead to successful farms under a given context to address land ownership and access inequalities and mitigate the 'triple challenges' of unequal household income, unemployment, and poverty. Therefore, in this study, we aimed to analyse the strengths and weaknesses of land reform farms ('farm issues') and use these issues to group farms and as the basis to develop recommendations specific for each group. Towards this aim, we assessed the extent of support from the state and constraints among the farm groups and gathered stakeholders' perceptions regarding the constraints faced in these farms. Furthermore, we conducted a SWOT analysis.

This paper is organised as follows: Section 2 is about the methods used in this study and provides details about the study area, selection of farms, statistical analysis and the analysis of strengths, weaknesses, opportunities and threats (SWOT analysis). Section 3 is results, explains the use of SWOT issues to group farms, and presents findings about post-settlement support from the state and the constraints perceived by farmers among farm groups. Furthermore, this section presents the contextual issues of climate change and prospects of financial support from the state, followed by the SWOT issues of the farm groups. Section 3 ends with synthesising the futures of land reform farm groups, emphasising the futures we desire. The conclusions of this study will be presented in Section 4, followed by recommendations in section 5.

2. Methods

2.1. Study area

We conducted this study in the Waterberg District Municipality (WDM) of Limpopo Province, South Africa. WDM has a semi-arid climate (GCIS, 2018; WDM, 2019). Mining, agriculture, and tourism are the main economic sectors in WDM. In WDM, agriculture contributes about 4% to the gross geographic product and employs about 21% of the labour force, in line with the whole of South Africa (GCIS, 2018; WDM, 2019). This study focused on four of the six local municipalities of WDM, namely Bela-Bela, Lephalale, Mogalakwena and Mookgopong. We selected these four local municipalities because they house about 80% of the LR farms in WDM (Netshipale et al., 2017).

2.2. Farm selection, data collection and statistical analysis

Land reform farms in South Africa are used for diverse agricultural activities (Aliber & Cousins, 2013; Antwi & Oladele, 2013; Lahiff, 2008). In 2012, there were about 175 LR farms in WDM, of which 140 were in the focus area of this study (Netshipale et al., 2017). In this study, we targeted 73 farms (transferred to new owners in 2011 or before) that were being used (referred to as *'active farms'*), particularly for agriculture. Land reform farms in WDM were classified into four farming system types 'based on land use activities and the contribution of activities to farm revenue and costs' (Netshipale et al., 2022). These farming system types were: rainfed crops plus ruminants- CR, horticulture- H, ruminants- R, and monogastrics- M. Ruminant production depended on natural pastures, crops on rainfall, horticulture on irrigated and monogastrics on the semi-controlled in-door environment. Furthermore, Netshipale et al. (2022) reported that farmers of type H and R had ample physical and financial capital endowments (referred to as *'better-off farmers'*). Comparatively, farmers of type CR and M comprised both the better-off and those with limited physical and financial capital endowments (referred to as *'poor farmers'*). For this study, we excluded one crocodile farm that did not fit under any farming, as mentioned above. One in-door, fully automated large-scale poultry farm as its SWOT issues differed from those of small-to medium-scale in-door monogastric farms of type M. Moreover, we excluded 21 farms where respondents were not keen to participate or unable to answer the survey questions. Hence, we investigated 50 farms, representing 35.7% and 28.6% of land reform farms in the focus area and the whole of WDM, respectively. Each farm was investigated under one of the four farming system types mentioned earlier. The distribution of investigated farms across farming system types (in brackets subprogrammes under which the land was transferred) were: CR = 7 (1 restitution, 2 SLAG and 4 LRAD), H = 14 (1 restitution and 13 LRAD), R = 17 (5 restitution, 5 LRAD and 7 PLAS), and M = 12 (2 SLAG and 10 LRAD) (Netshipale et al., 2022).

We followed a stepwise approach in this study, which comprised a survey, stakeholder workshop and SWOT analysis. First, we surveyed the farms to collect information about the support provided by the state to farmers and about the constraints faced by farmers. In Bela-Bela and

Lephalale local municipalities, state officials from the Limpopo Department of Agriculture accompanied the researchers during farm visits. The presence of state officials might have influenced farmers to over-report the support provided by the state. Hence, we (the researchers) took transect walks during farm visits in all four municipalities to counter this bias. These transect walks aimed to inquire about the origin of (i) all resources (except land) which were visible on the farms and (ii) farm inputs (like fertilisers for crop and horticulture and medication and supplementary feeds for livestock) used for the existing and or to be used for the imminent farming activities. The observations during these transect walks helped us judge whether reported government support was realistic. If we considered farmers' reports biased, we discussed the level of government support with them. Second, a stakeholder workshop was organised to validate the survey findings and explore solutions to identified constraints. Third, we conducted a SWOT analysis of diverse groups of farms based on knowledge generated from earlier steps. We explain how these steps were executed in the following sections.

We conducted interviews, using semi-structured questionnaires, with farmers or their representatives, on farms owned by households individually. Farmers or their representatives were interviewed on farms owned by households in groups. We collected quantitative information based on recall for the year preceding the interview. In this study, an external stakeholder was a person, or an organisation not affiliated with the investigated but had either mandatory or voluntary interests. The South African policies on land reform envisaged that external stakeholders would participate in land reform farms (DLA, 1997; 2006; DRDLR, 2013; MALA, 2001). Hence, state institutions like the Department of Rural Development and Land Reform, the Department of Agriculture, Forestry and Fisheries, and district and local Municipalities are commissioned to support farmers. In addition, private organisations like Agricultural Research Council, farmer organisations and large-scale commercial farmers provide support voluntarily.

We collected data about the support provided by the state institutions mentioned above to *ascertain if the state had provided post-settlement* support. In this study, we focused on whether capital support was provided since farmers became new landowners until the day of the interview. Capital support comprised financial contributions to acquire physical capital, production inputs, payments for hired labour and their combinations. To address *constraints*, we also collected data about constraints faced by farmers. For farms investigated in this study, we used their data from previous studies to *present the farm groups' ranges of land sizes and farm gross margins*.

We used SPSS statistical package (IBM Corp. Released, 2020) to analyse the categoric data from the survey. Chi-square and Fisher-Freeman-Halton exact tests are commonly used to analyse the distributions of categorical variables, and each test has requirements (Nowacki, 2017). The sample size (n) should be ≥ 50, and $\leq$20% of the cells in the matrices should have counts of <5 for the Chi-square test to be used. The opposite suffices for the use of Fisher-Freeman-Halton exact tests. Our data fitted Fisher-Freeman-Halton exact test; hence it was used to assess differences in the distributions of variables among farm groups. Differences will only be mentioned when significant ($P < 0.05$).

The findings from the survey were shared and interrogated with participants during the stakeholder workshop, which we organised in Klein-Kariba, Bela-Bela, South Africa. At the workshop, we aimed to validate the survey findings and explore possible solutions to constraints faced in land reform farms of WDM. Farmers, officials of state institutions, and representatives of private organisations were the targeted stakeholders. State institutions comprised the Department of Rural Development and Land Reform, the Department of Agriculture, Forestry and Fisheries, and the municipalities (district and local). Private organisations comprised the Agricultural Research Council, large-scale commercial farmers, African Farmers Association of South Africa, Agri South Africa, Waterberg District Communal Property Associations forum and the Electricity Supply Commission. The Agricultural Research Council and the Electricity Supply Commission were not represented during the stakeholders workshop. Discussions during this workshop yielded a summary of constraints and possible solutions.

2.3. SWOT analysis

We chose to analyse strengths, weaknesses, opportunities, and threats (SWOT) in this study because it allows for the assessment of the strengths and weaknesses in a systemic way (Chermack & Kasshanna, 2007; Gürel & Tat, 2017; Leigh, 2006). Information about the environment in which the farms exist is an input for SWOT analysis. This environment comprises internal (i.e., strengths and weaknesses) and external (opportunities and threats) issues. SWOT analysis output could be interrogated further by confronting the internal issues against the external issues to determine the possible development pathways, which are referred to as 'the futures of land reform farms' in this paper. The accuracy of the information about the environment determines the relevancy of the development pathways suggested by SWOT analysis.

We conducted the SWOT analysis twice. Firstly, to establish if internal and external issues were diverse within any existing farming systems mentioned earlier. The first analysis ensured the grouping of farms with homogeneous issues to make the second SWOT analysis relevant. Secondly, to assess the farm's strengths and weaknesses guided by the outcome of the first analysis. The findings from previous studies showed that a mix of farmers existed in type CR and M: poor and better-off, considering physical and financial capital (Netshipale et al., 2020, 2022).

Furthermore, poor farmers used small portions of their land, whereas the better-off used whole farms (Netshipale et al., 2017). In type CR and M, these observed diversities in farmers' social class and extent of land use have implications for the opportunities (like being prioritised state support) and threats (like the ability to mitigate the effects of climate change). Hence, these diversities dictated that we create new farm groups subjected to the second (final) SWOT analysis. We created new farm groups by merging either all farms of a particular farming system type with the better-off farms of another type or poor farms of two farm types together. The outcomes of these merges are the three farm groups (A, B and C). These farm groups were: A-better-off farms dominated by extensive land uses, encompassing farms of type R and better-off farms of type CR; B- better-off farms dominated by intensive land uses, encompassing type H and better-off farms of type M; and C- poor farms dominated by extensive and intensive land use, encompasses poor farms of type CR and M. The creation of farming system groups did not result in a lack of fit for farms in the original sample ($n = 50$).

We used findings from the survey and the stakeholder workshop to conduct the farm groups' second/final SWOT analysis. Furthermore, we included the conclusions from a literature review about the perceived and anticipated consequences of climate change for semi-arid South Africa and the prospects for the financial status of the South African economy on the farm groups. Relevant information was categorised into internal and external issues. Internal issues describe the attributes of a farm within a particular farm group, considered strengths or weaknesses. In contrast, external issues describe the attributes of the environment in which farms exist, which could present either opportunities or threats. The opportunities and threats could be applied either for a specific farm group, like the availability of an irrigation scheme for horticulture (group B) or for all the groups, like climate change which affects all farms within a particular agroecological region. We finalised the SWOT analysis for these farm groups after discussions with representatives of stakeholders, namely the Agricultural Research Council, Universities of Limpopo and Venda, large-scale commercial farmers, Waterberg District Communal Property Associations Forum, Department of Agriculture, Forestry and Fisheries, and Department of Rural Development and Land Reform.

3. Results and discussion

3.1. Methodology

The small sample size (n = 50 farms) for the survey conducted in this study was at a borderline, accommodating the use of either the Chi-square or Fisher-Freeman-Halton exact test to assess the distributions of variables, with the assumptions to be met determining the analysis method (Nowacki, 2017). We analysed data from the survey using Fisher-Freeman-Halton exact test because >20% of the cell in our matrices had counts of less than 5, violating a condition for using the Chi-square test. Acknowledging that the sample size for our survey was small, we included a stakeholder workshop and reviewed the literature to diversify the sources of information. Our SWOT analysis relied on information from these diverse sources as they gave a better understanding of the environment in which the farms exist. Furthermore, using this reliable information to conduct a SWOT analysis allowed us to envisage the relevant futures of land reform farms in this study.

3.2. Grouping of farms

Farmers' physical and financial capital endowment class (with the distinction between poor and better-off farmers) influenced the opportunity cost of family labour. In South Africa's rural areas, the lack of knowledge and skills associated with limited access to education made poor farmers and members of their households unlikely to get better-paying employment in the formal sectors of the economy (World Bank, 2018). Furthermore, access to education for the poor led young people from poor households to migrate to towns and cities to get formal employment in line with their knowledge and skills. Hence, poor households that received land from land reform in the mid-2000s were still poor in 2014 (Netshipale et al., 2020). In rural South Africa, members of poor households are likely to get employment in the informal sector, which pays lower salaries, which makes the opportunity cost of family labour for these households low. On the contrary, members of better-off households have a high opportunity cost of family labour because their access to resources and education makes them likely to get formal employment in towns and cities.

Farmers of type CR and M represented a mix of individuals from poor and better-off households (Netshipale et al., 2022). Differences in capital endowments, household aims and the ability of farmers to tolerate risks are reported among the causes of the diversity in farmers' capital endowment class within farming system types (Giller, 2013). Within type CR and M, this diversity in farmers' capital endowment class led to the diversity in SWOT issues between farms of the poor and those of the better-off. Hence, we subdivided farms of type CR and M into *'poor farms'* of the poor and *'better-off farms'* of the better-off. In the study area, we observed that farmers in reform land dominated by capital-extensive activities (i.e., of type CR and R) had limited possibilities of partnerships with large-scale commercial farmers.

On the contrary, ample possibilities existed for farmers practising capital-intensive activities (i.e., of type H and M). SWOT issues of farms were similar between some of the farming system types and the sub-types (i.e., R and CR better-off, and H and M better-off), and between the sub-types (CR poor farms and M poor farms); hence we categorised these farms into three groups, A - C. The farms of group A were better off (regarding physical and financial capital). They were of better-off farmers, and capital-extensive activities of ruminants on natural pastures (R) or rain-fed crops plus ruminants on natural pastures (CR) were dominant. *'Better-off farms with extensive activities'* describes group A farms, with a land size of 9 to 9254 ha and a gross margin of R-9175 to 53 993. In the study area, farmers of group A depended on formal markets for produce as households rarely slaughtered cattle for consumption, and crops like sunflowers are not natural food for humans (Netshipale et al., 2022). Group B farms differed from group A farms exclusively because their farmers practised capital-intensive activities of irrigated horticulture (H) and in-door monogastrics (M). *'Better-off farms with intensive activities'* describes group B farms, with a land size of 20 to 1849 ha and a gross margin of R-17 890 to 207 263. In group B farms, the better-off farmers of type H depended on formal markets, whereas the better-off farmers of type M depended on informal markets for produce (Netshipale et al., 2022). We ascribed group B farms' dependence on diverse markets to two factors. Firstly, the scale of production exceeded demand in informal markets for type H farms, and secondly, the inability of type M farmers to produce for the formal market due to limited physical capital. Therefore, we deduce that the demands in the markets and farm physical capital determined the scales of production in group A and B. The farms of group C were of poor farmers and had poor physical and financial capital. Capital-extensive activities of CR or capital-intensive activities of M were dominant in group C farms. *'Poor farms with either extensive or intensive activities'* describes group C farms, with a land size of 26–768 ha and a gross margin of R168 to 1114. In group C farms, poor farmers of type CR depended on formal markets, whereas those of type M depended on informal markets for produce (Netshipale et al., 2022). The dependence of Group C farmers on diverse markets is for reasons like those stated for group A and B farms. However, the availability of external support determined the scale of production in group C farms. Next, we assessed the extent of state support and constraints and conducted the SWOT analysis of farms of the three farm groups described above.

3.3. State support and whole-farm constraints

In this section, we present and discuss external support availability reflected by the 'receipt of financial support from the state' and the constraints perceived by farmers, using data from the survey and the views of those who participated during the stakeholder workshop. Five of the constraints discussed during the workshop, namely lack of finance, lack of access to markets, illegal hunting, livestock theft, and predation, were also covered in the survey. Participants discussed lack of water which encompassed limited water sources and lack of access rights to water, whereas the survey focused on the water to drench livestock and irrigation. Lack of electricity, inconsistent cash flow and debts with the Land Bank of South Africa were constraints discussed during the workshop but were not covered in the survey. We categorised constraints into those perceived for the whole farm (a farm as a production unit) and those associated with specific land-use activities. In this section, we focused on constraints perceived for the whole farm. Whole farm constraints comprised natural occurrences (i.e., drought, floods, hail and frost), lack of access to inputs, shortage of labour, theft of farm's physical capital, inability to participate in markets for input and produce, lack of finance, lack of knowledge and skills on existing agricultural activities, and the inability of active households to make binding decisions about farm operations (considered proxy for *'organisational challenges'*, particularly in farms owned by households in groups). An example of organisational challenge is when farmers cannot make a binding decision because they cannot form a quorum in a farm overseen by a communal property association (CPA).

Table 1 presents the proportions (%) of farms that received state support and perceived whole-farm constraints across farm groups. Table 2 presents a summary of farmers' constraints and the proposed solutions, as raised and discussed by the participants during the stakeholder workshop. A simultaneous explanation of the information in Tables 1 and 2 is done because the information is relational. The percentage of farms that reported receipt of financial support from the state and which perceived financial constraints did not differ ($P > 0.05$) between the farm groups (Table 1). The overall averages (n = 50) for these constraints were: 42.0% mentioned receiving financial support from the state, and 40.0% mentioned a lack of finance. In this study, the grouping of farms according to their SWOT issues considered farmers' capital endowment class. However, this consideration did not result in differences in receiving financial support from the state or experiences of

Table 1
Proportions (%) of farms that received state support and perceived whole-farm constraints across farm groups.

	Farm group[a]		
	A	B	C
Farms (n = 50)	22	24	4
Financed by the state (FS)	40.9	37.5	75.0
Constrained			
Finance	31.8	41.7	75.0
Nature	18.2	45.8	0.0
Access to input markets (AIM)	9.1	0.0	25.0
Access to produce markets (APM)	18.2	25.0	0.0
Theft of resources	9.1	4.2	25.0
Labour	0.0	4.2	0.0
Organisational arrangements (OA)	13.6	4.2	25.0
Knowledge and skills (KS)	13.6	8.3	0.0

[a] A- Better-off farms with extensive activities (of ruminants and crops plus ruminants), B- Better-off farms with intensive activities (of horticulture and monogastrics), C- Poor farms with either extensive or intensive activities (of crops plus ruminants or monogastrics); Nature- (drought, floods, hail and frost); Two-sided Fisher-Freeman-Halton exact test (P = 0.424, 0.320, 0.058, 0.061, 0.661, 0.264, 1.000, 0.181 and 0.779 for farm group and FS, finance, nature, AIM, APM, theft, labour, OA and KS, respectively).

Table 2
Summary of farmers' constraints and the proposed solutions, as discussed during a stakeholder workshop.

Constraint	Proposed solution/s
Lack of finance	The government funding process for land reform was under review at the time of stakeholder workshop. When finalised, the Limpopo Department of Agriculture (LDA) should assist farmers with funding applications. Organising information days between government-approved private funders and farmers was tasked to the LDA.
Lack of electricity	The chairperson of the Waterberg District Communal Property Associations Forum will liaise with the national power supplier (the Electricity Supply Commission) and organise a stakeholder workshop to pave the way forward.
Lack of water	Solving financial challenges partially addresses water challenges. Affected farmers were tasked to develop water use plans, and the LDA was tasked to facilitate interactions between farmers and the department/s that regulates water use.
Inconsistent cash flow, lack of access to markets and debts with the Land Bank of South Africa	The mapping out of the way forward on these constraints was tasked to the LDA's agricultural economics division. The way forward should be mapped during information days which the LDA will organise for government-approved private funders and farmers.
Illegal hunting, stock theft and predation	Inter-sectorial forums could address these constraints because they had implications for several departments (like Agriculture, Policing and Environment).

Source: stakeholder workshop organised by authors (04 March 2015, Klein Kariba in Bela-Bela).

financial constraints between the farm groups.

Farmers reported that they received financial support from the state (especially production inputs for crops, horticulture, and monogastrics) based on the adopted scales of production. In addition, they indicated that the support they received targeted all small-scale and emerging farmers; however, only some received it, as shown in Table 1. This non-discriminative support to small-scale and emerging farmers (with emphasis placed on land reform farms) was declared in inception documents of farmer support programmes, namely, CASP by the Department of Agriculture (DoA, 2005) and RADP by the Department of Rural Development and Land Reform (DRDLR, 2011). It was this lack of discrimination by these support programmes which to their two critical limitations as revealed by the findings of this study and reported in the literature: first, they lacked funds to cover all targeted farmers, and second, the funds provided to a fraction of the farmers did not cater for all their financial needs (Aliber & Cousins, 2013; Aliber & Hall, 2012; Binswanger-Mkhize, 2014; Lahiff & Li, 2012; Nesamvuni et al., 2016; Valente, 2011).

During the workshop, state representatives confirmed literature reports that it was unable to provide support timely to all the farmers (Aliber & Hall, 2012; Nesamvuni et al., 2016). Furthermore, the state representatives declared that the provision of support neither targeted specific land use activities nor the farmer's financial and physical capital endowments. In this study, we ascribed the observed lack of association between farmers' capital endowment class and financial constraints in this study to two issues. Firstly, the adoption of small-scale commercial production, which require less money, by poor farmers of group C. Secondly, the better-off of group A and B, who operated at the medium-scale commercial level, needed more money to finance their farming aspirations. Hence, we deduce that without support from the state, poor farmers will be more financially constrained than better-off farmers, where both classes adopt similar scales of production, as suggested in the literature (Binswanger-Mkhize, 2014; Lahiff et al., 2008).

The number of farms that experienced natural constraints did not differ (P > 0.05) between farm groups, and it was perceived by 30.0% of the farms overall. We explained this constraint in detail because it is associated with the effects of climate change (Table 1). In the study area, horticulture farmers reported incidences of a flood, hail, and frost. In comparison, those practising in-door monogastric production reported floods in some sites. The natural incidences listed above-affected farmers practising capital-intensive activities. Furthermore, farmers observed inconsistent rainfall patterns, which have yet to lead to a drought. Hence, natural constraints were perceived in fewer farms dominated by ruminants on natural pastures (i.e., those of group A). Natural constraints were not perceived in in-door monogastric farms of group C because they were in sites where flooding did not occur. Therefore, these results confirmed the common trend in which farming systems dominated by ruminants on natural pasture and in-door monogastrics are less susceptible to climate change than those dominated by rainfed crops and irrigated horticulture (Deuninck et al., 2008; DPIF, 2008; Scholtz et al., 2016; University of Arkansas, 2012).

The percentage of farms that perceived any of the below-mentioned other whole-farm constraints did not differ (P > 0.05) between farm groups (Table 1). The overall averages (n = 50) for other whole-farm constraints encounters were: 20.0% mentioned inability to participate in markets for produce, organisational challenges and lack of knowledge and skills were each mentioned in 10.0%, 8.0% mentioned the theft of the farm's physical capital, 6.0% mentioned lack of access to markets for inputs and 2.0% mentioned the shortage of labour. In addition, we observed that (mean ± sd), in investigated farms (n = 50), group C farmers had been using the land for the most prolonged period (12.0 ± 0.00 years) when compared to shorter periods of group A and B farmers (4.3 ± 2.69 and 4.3 ± 1.95 years, respectively). These differences in land use periods are because poor group C farmers received their land during the initial phase of the South African land redistribution programme (i.e., settlement/land acquisition grant model- SLAG). In contrast, most of the better-off group A and B farmers received their land during the later phases of the same programme (i.e., land redistribution for agriculture development- LRAD and proactive land acquisition strategy- PLAS, models) and only a few received land through the land restitution programme (DLA, 1997; 2006(DLA, 1997; 2006; MALA, 2001).

We observed, in this study, a low prevalence of other whole-farm constraints. However, those reported most in literature are lack of access to markets for inputs and outputs, lack of knowledge and skills of farming, and organisational challenges (Aliber & Cousins, 2013; Antwi & Oladele, 2013; Binswanger-Mkhize, 2014; Lahiff & Li, 2012; MacLeod et al., 2009; Valente, 2011). We ascribed this low prevalence, in this study, to various factors. Firstly, in most farms, farmers have adopted small-to medium-scale commercial production (guided by their farming experience of at least two years), which requires fewer skills and knowledge than large-scale commercial production. Hence, farmers' knowledge and skills were appropriate for their farming practices. In the few cases where farmers had adopted the latter, external stakeholders provide training and advisory services (Business Enterprises, 2015; Valente, 2011). State departments either provided training and advisory services in line with their mandates or financed (through CASP and RADP) other external stakeholders to provide them (DoA, 2005; DRDLR, 2011; Maka & Aliber, 2019; Shabangu et al., 2021). Secondly, farmers adapted their activities to capital availability (own or from the state). Thirdly, farmers on farms owned by households in groups have found common interests that remedy the organisational challenges.

During the workshop, participants concurred that there were no quick solutions to constraints listed in Table 2 but processes that could contribute to solving them. The findings from the survey, the consensus reached during the workshop, and the literature indicates that lack of finance is a significant constraint and was the most felt by farmers (Antwi & Oladele, 2013; Binswanger-Mkhize, 2014; Lahiff & Li, 2012; MacLeod et al., 2009). Hence, we concluded that the financial constraint was the most important; intensive land use activities (irrigated horticulture, in particular) were more sensitive to natural constraints; and for other whole-farm constraints, farmers have adapted their practices, partly based on experience.

3.4. Constraints to specific land use activities

This section focused on constraints associated with specific land-use activities. Four land use activities covered in this section were: ruminants on natural pastures, rainfed crops, in-door monogastrics, and irrigated horticulture. The constraints specific to ruminants and monogastrics were similar, and those specific to crop and horticulture were also similar. These similarities of perceived constraints led to two main categories of land use activities with specific constraints: livestock and arable farming. Constraints specific to livestock were lack of fences dividing grazing land, shortage of grazing land, lack of water to drench livestock, livestock diseases, illegal hunting, stock theft and predation. Illegal hunting is a constraint in livestock farms which share borders with game farms because traps set by people hunting game kill livestock. Hence, game hunting was unauthorised or illegal on livestock farms. Constraints specific to arable farming were poor soil quality, lack of equipment and implements, pests, and theft of produce.

Table 3 presents the proportions (%) of farms that perceived land-use-specific constraints across farm groups. Of the 50 farms we assessed, 38 had livestock, and the prevalence of constraints associated with ruminants and monogastrics were assessed on those (i.e., for constraints associated with livestock n = 38). The percentages of farms that encountered constraints specific to livestock did not differ ($P > 0.05$) between the farm groups. In these 38 farms, livestock diseases were perceived in 52.6%; hence it was the most critical constraint. At the same time, the prevalence of other livestock-related constraints were: stock theft (28.9%), lack of water to drench livestock (18.4%), lack of fences dividing grazing land (15.8%), shortage of grazing land (13.2%), predation (10.5%) and illegal hunting (7.9%). Livestock diseases are highly prevalent in investigated farms because eco-tourism (which encompasses game farming) is a significant economic activity in the Waterberg District Municipality, making the district a livestock-game contact area (WDM, 2019). Game farming increases the possibility of transmission of diseases from game to livestock in livestock-game contact areas (Meunier et al., 2017; Siembieda et al., 2011). In livestock-game contact areas, managing livestock diseases requires interventions from external stakeholders, especially the state.

Table 3
Proportions (%) of farms that perceived land-use-specific constraints across the farm groups.

	Farm group[a]		
	A	B	C
Constraints to livestock (n = 38)	20	14	4
Diseases	45.0	57.1	75.0
Stock theft (ST)	30.0	21.4	50.0
Drenching water (DW)	25.0	7.1	25.0
Dividing fences (DF)	20.0	7.1	25.0
Grazing land (GL)	20.0	7.1	0.0
Predation	15.0	7.1	0.0
Illegal hunting (IH)	10.0	7.1	0.0
Constraints to arable farming (n = 31)	9	18	4
Pests	44.4	55.6	0.0
Equipment and implements (EI)	33.3	22.2	25.0
Theft of produce (TP)	11.1	11.1	0.0
Poor soil (PS)	0.0	0.0	25.0

[a] A- Better-off farms with extensive activities (of ruminants and crops plus ruminants), B- Better-off farms with intensive activities (of horticulture and monogastrics), C- Poor farms with either extensive or intensive activities (of crops plus ruminants or monogastrics); Nature- (drought, floods, hail and frost); Two-sided Fisher-Freeman-Halton exact test ($P = 0.655$, 0.597, 0.387, 0.439, 0.518, 0.766, 1.000, 0.129, 0.149, 0.844 and 1.000 for farm group and diseases, ST, DW, DF, GL, predation, IH, PS, pests, EI and TP, respectively).

During the stakeholder workshop, participants recommended that farmers participate in inter-sectorial forums. Such forums may yield integrated strategies that could contribute to addressing constraints of diseases, but also illegal hunting, stock theft and predation. Participants also concurred, during the workshop, that addressing the financial constraint could partially resolve the lack of fences dividing grazing land, shortage of grazing land and lack of water to drench livestock. This consensus is because money is needed to buy resources to establish fences and sources of water to drench livestock and buy more land. We concluded that livestock diseases were the primary constraint for livestock.

Of the 50 farms we assessed, 31 had arable farming. In these 31 farms, we assessed the prevalence of constraints associated with crop and horticultural activities (i.e., for constraints associated with arable farming n = 31) shown in Table 3. The percentages of farms that encountered constraints specific to arable farming did not differ ($P > 0.05$) between farm groups. In these 31 farms with arable activities, pests were the major constraint experienced in 45.2% of farms. In contrast, the prevalence of other constraints were: lack of equipment and implements (25.8%), poor soil quality (3.2%) and theft of produce (9.7%). We could not find literature addressing pests as a constraint for land reform farms. The observed low prevalence of lack of equipment and implements of 25.8% could be because farmers received physical capital support from the state, through CASP and RADP, over the years (Business Enterprises, 2015; Maka & Aliber, 2019; Nesamvuni et al., 2016; Shabangu et al., 2021). We found a farm with poor soils in group C, characterised by rocky soils, but did not find any in group A and B farms. This farm with poor soil did not exist due to differences between farm groups. We ascribed the existence of this farm to two factors. Firstly, the introduction of an additional land use activity that was not the intended use when the land was received (i.e., the introduction of an arable activity in a monogastric farm). Secondly, the poor farmers introducing the activity needed money to finance this aspiration. Hence, poor soils were not a constraint in group A and B farms used by better-off farmers. We concluded that pests were the primary constraint faced by farms with arable farming.

The practical importance of diseases for livestock and pests for crops

and horticulture is not limited to land reform farms but the whole agricultural sector in South Africa (GCIS, 2018). Therefore, we concluded that diseases and pests are the most critical constraints associated with specific agricultural land uses.

3.5. SWOT issues of the farm groups

3.5.1. Contextual issues

During the stakeholder workshop, participants indicated two contextual issues that were very important for the development of land reform farms: climate change and the availability of financial support from the state. First, climate change is critical because 'natural ecosystems and human systems' are sensitive (IPCC, 2014). Out-door agriculture depends on agroecosystems and hence on climatic conditions. The consequences of climate change could present threats to farms. South Africa (including the study area) is among the world's semi-arid regions. In these regions, high rainfall variability and prolonged periods of drought are projected consequences of climate change (Hornby & Cousins, 2016; Pereira, 2017; Turpie & Visser, 2012). These projected consequences of climate change will affect all farms. However, the impact is often immediate for crop and horticulture (i.e., arable farming) because drought means limited rainfall (key for rainfed crops). Low rainfall reduces the availability of irrigation water from rivers and underground (key for irrigated horticulture).

Since 1995, when land reform commenced in South Africa, the state has yet to provide adequate post-settlement financial support for land use by disadvantaged farmers. Hence, the deficiencies in post-settlement financial support contributed to the limited contribution of land reform to livelihoods (Aliber & Cousins, 2013; Binswanger-Mkhize, 2014; Presidential Advisory Panel, 2019, pp. 62–64; Valente, 2011). This association between post-settlement financial support and land use meant we envision the prospects for the availability of financial support from the state on the development of land reform farms. The financial status of the nation's economy partially influences the availability of its financial support to all economic sectors. The South African economy has not been doing well, and its decline is anticipated (AFDB, 2020; Karodia et al., 2016). This anticipated economic decline will limit the availability of financial support to farmers from the state and other external stakeholders. We deduce that poor farmers of Group C will be affected most by the anticipated decline of the South African economy.

3.5.2. Analysis of SWOT issues of farm groups

This section discusses the SWOT issues of farms and farmers of the three farm groups based on the second SWOT analysis. The survey findings, workshop deliberations and literature guide this discussion. The strengths and weaknesses covered the extent of financial requirements of land-use activities, the opportunity cost of family labour, the farm's physical capital conditions, and the extent to which land-use activities depended on external support. Opportunities and threats covered the possibility for farmers to partner with those in large-scale commercial production, prospects for financial support from the state, susceptibility of land use activities to climate change, and the availability of formal markets for produce.

Table 4 presents the SWOT issues of farms and farmers of the three farm groups. The strengths of group A farms (used by better-off farmers for extensive activities) were that: they had adequate physical capital, and their farmers needed less external support because the extensive activities in these farms required limited inputs from the markets. Farmers of group A had limited possibilities for partnerships with large-scale commercial farmers because their farms had fewer possibilities for external stakeholders to invest due to the capital-extensive nature of the land use activities. Another weakness of group A farmers was the high opportunity cost of family labour, as their educated/skilled family members were likely to get formal employment elsewhere in the economy. Opportunities for group A farms were: the existence of formal markets for produce and moderate susceptibility of activities to climate change. For farms of group A, the water was required for drenching livestock only, and rainfed crops were planted based on weather predictions. Hence, the susceptibility of these farms to climate change was moderate. At this time, climate change predictions are that there will be sufficient rain to sustain the activities in group A farms (Hornby & Cousins, 2016; Pereira, 2017; Turpie & Visser, 2012). A threat for better-off farmers of group A is that there are fewer possibilities for support from the state because the prospects for limited state finances are high (AFDB, 2020; Karodia et al., 2016). Limited state finances are a

Table 4
The strengths, weaknesses, opportunities, and threats (SWOT) issues of farms and farmers of the three farm groups.

		Farm group		
Description		A: better-off farms with extensive activities (of ruminants and crops plus ruminants).	B: better-off farms with intensive activities (of horticulture and monogastrics).	C: poor farms with extensive or intensive activities (of crops plus ruminants or monogastrics).
Internal issues	Strengths	Farms had adequate physical capital, and farmers needed less external support as limited market inputs were required.	Farms had adequate physical capital and ample possibilities for partnerships with large-scale commercial farmers as activities were capital-intensive.	Family labour had a low opportunity cost.
	Weaknesses	Limited possibilities for partnerships with large-scale commercial farmers as activities were capital-extensive, and family labour had a high opportunity cost.	Farmers needed more external support to acquire ample market inputs, and family labour had a high opportunity cost.	Farms needed more physical capital, which led to limited possibilities for partnerships with large-scale commercial farmers, and farmers depended on external support as they needed to improve.
External issues	Opportunities	Formal produce markets existed, and activity susceptibility to climate change was moderate.	Formal produce markets existed.	The susceptibility of activities to climate change was moderate, and there were ample possibilities for state support as farmers were poor.
	Threats	Possibilities for state support were limited because these farmers were better off and practised extensive farming.	The susceptibility of activities to climate change was high, and possibilities for state support were in-between because these farmers were better off and practised intensive farming.	Farms might collapse due to limited state finance.

looming threat because the better-off were given farms to address inadequate post-settlement support (DLA, 2006; MALA, 2001). Hence, the state support for these better-off farmers partly because they are expected to secure on-farm investments from the private sector. This is declared in 'the blended finance scheme' of the Department of Agriculture, Land Reform and Rural Development, which indicates that the department 'will provide a grant and leverage private funding' (https://www.dalrrd.gov.za/docs/media/BFS%20Pamphlet%202021.pdf Accessed 28 January 2023). The Presidential Advisory Panel on Land Reform and Agriculture advocated this blended financing 'model' as a mechanism capable of 'leveraging private sector expertise and capital' (Presidential Advisory Panel, 2019, pp. 62–63).

Most of the SWOT issues for group B farms, used by better-off farmers for intensive activities, were like those for group A farms, used by better-off farmers for extensive activities. Hence, we highlight only the differences, of which there were three (are included in Table 4). Firstly, farmers of group B had the additional strength of ample possibilities for partnerships with large-scale commercial farmers because adequate farm physical capital and intensive activities create opportunities for external stakeholders to invest. Secondly, those farmers had a weakness of needing more external support because they practised intensive activities that needed ample market inputs. Thirdly, group B farmers are threatened by the high susceptibility of intensive activities to climate change because irrigated horticulture depends on water availability, and in-door monogastrics depend on climate controls like air cooling systems to ensure constant room temperature and humidity.

Table 4 also presents the SWOT issues of group C farms (used by poor farmers for extensive or intensive activities). The poverty of group C farmers meant they had a strength of low opportunity cost of family labour because members of their households were unlikely to get formal employment elsewhere in the economy. Members of their households could not get employment because they needed essential knowledge and skills for the employment types that pay decent salaries (World Bank, 2018). The weaknesses of group C farms and farmers were: that these farms needed more physical capital, which limited possibilities for these farmers to partner with large-scale commercial farmers. These farmers depended on external support as they were poor. Group C farms and farmers had these opportunities: moderate susceptibility of land use activities to climate change, and farmers are prioritised by the state for support to contribute to poverty alleviation and social equity. We ascribed group C farms' low susceptibility to climate change to the dependence of rainfed crops on weather predictions, and in-door monogastrics, at relatively small-scale levels, not requiring sophisticated in-door environmental controls. The envisaged limited support from the state threatens the poor farmers of Group C, and with the support, these farms will continue.

3.5.3. *The futures of land reform farm groups*

The futures of the three farm groups, which existed in the land given to the previously disadvantaged, were further explored by cross-questioning the SWOT analysis output. We did this by confronting the internal issues (strengths and weaknesses) with the external issues (opportunities and threats). The confrontation matrices produced four futures for each farm group: high production, improved production, maintained production, and an unwanted future. Maintained production refers to the levels of production which existed in land reform farms, which made these farms contribute poorly to the lives of the new landowners (Aliber & Cousins, 2013; Antwi & Oladele, 2013; Bradstock, 2005; Lahiff et al., 2008; Netshipale et al., 2020; Valente, 2011). The unwanted future is negligible production or changes in land use activities or idle farms. For each farm group, we discuss the ideal future (i.e., the future we desire for land reform farms to contribute to equality, job creation and poverty alleviation), which could be improved or high production. Firstly, we describe the ideal future, cross-examine the hindrances to its attainment, and scrutinise the probable mechanisms to achieve it.

High production is the ideal future for group A and B farms (i.e., farms used better-off farmers for either extensive or intensive activities). This future entails maximum production levels attainable in low-input low-output and high-input high-output production systems of group A and B farms, respectively. Farmers of group A and B were achieving maintained production because they need more funds. This financial constraint meant farmers could not use the land to its maximum extent and reduced their potential to mitigate some of the effects of climate change. Furthermore, the extensive land use of group A farms and the inadequate physical capital of group B farms limited the possibilities for these farms to attract external investments. Two interrelated issues will influence high production in better-off farms of group A and B, namely: the increase in demand for food and investments in farming by people or organisation none other than the farmers, the farms, and the state (i.e., the 'external stakeholders'). The demand for food will likely increase due to population growth (FAO/WWC, 2015). In this scenario, the state and external stakeholders will prioritise food production to meet the anticipated demand increase. Hence, we envisage high production levels associated with the availability of finance from external stakeholders in group A and B land reform farms. In group A and B farms, the anticipated access to external finance will yield high production levels if it causes an increase in the scale of production (FAO/WWC, 2015). The production scale will increase either through expansion of the area used or an increase in farm inputs, or both. We concur with The Presidential Advisory Panel on Land Reform and Agriculture that the 'blended financial model' which attracts private investors, is vital to high production in better-off land reform farms (Presidential Advisory Panel, 2019, pp. 62–63; https://www.dalrrd.gov.za/docs/media/BFS%20Pamphlet%202021.pdf Accessed 28 January 2023). However, the availability of external finance will yield high production only when the perceived and predicted effects of climate change are mitigated.

Farmers, regardless of their class, must counter the predicted effects of adverse climatic conditions by adopting climate-smart agricultural practices to attain high production (Khatri-Chhetri et al., 2017; Lopez-Ridaura et al., 2018; Managa & Nkobole-Mhlongo, 2016; Murage et al., 2015; Rust, 2019; Shikuku et al., 2017). The practices to be adopted include drought-tolerant plant varieties, rainwater harvesting, drip irrigation, integrated pest management and intercropping with legumes for arable farming. Livestock farmers could adopt improved livestock feeding, climate-smart housing and drought-tolerant animal species like goats. Goats will be the livestock of choice because they are mixed-feeding ruminants (i.e., eat mainly leaves from bushes and grass) that can survive solely on browse (Mkhize, 2015). In addition, some trees are less susceptible to droughts than grass due to their well-developed root systems. We deduced from this discussion that high production could be realised from land reform farms used by better-off farmers if there are private sources of finance and farmers adopt climate-smart agricultural practices. Private financing of farmers was also alluded to by The Presidential Advisory Panel on Land Reform and Agriculture (Presidential Advisory Panel, 2019, p. 52).

Improved production is the ideal future for group C farms (i.e., farms used by poor farmers for either extensive or intensive activities), and it entails that there must be an improvement to the existing limited and unreliable production. Our findings about the constraints attribute this limited production on group C farms to insufficient financial support, though literature suggests that lack of knowledge and skills is among the causes (Aliber & Cousins, 2013; Binswanger-Mkhize, 2014; Lahiff & Li, 2012; Valente, 2011). Furthermore, the SWOT issues indicate that group C farms need better physical capital, which limits their ability to attract private investments. Group C farms are dependent solely on the state for financial support. The desired improved production is achievable on farms of Group C if the expected outcomes of the above-mentioned blended financing model, being implemented in better-off farms, are realised. Positive outcomes of this model will avail more funds for the state to support poor farmers. Similarly to farmers of group A and B, group C farmers must adopt climate-smart agricultural practices because

the availability of state funds will only result in maintained production.

By exploring the future of land reform farms of the three farm groups, we have broadened our understanding of the causal process, connections and logical sequence underlying the diversity of these farms and generated the knowledge needed to develop strategies and interventions (Leach et al., 2010; Lindahl et al., 2016; Wright et al., 2013). Our study implies that the ownership and access to land gained by the South African natives through land reform can contribute more to mitigating the 'triple challenges' of unequal household income, unemployment, and poverty. The contribution is likely to occur if increased production which considers climate change is realised through collaborative efforts between the public and private sectors.

4. Conclusions

In this study, we aimed to understand the strengths and weaknesses of land reform farms by assessing the extent of support from the state and constraints and conducting SWOT analyses of the three farm groups. The farm groups were: A-better-off farms dominated by extensive ruminants or crops plus ruminants, B- better-off farms dominated by intensive horticulture or monogastrics, and C- poor farms dominated by either extensive crops plus ruminants or intensive monogastrics. Two factors influenced the strengths and weaknesses of these three farm groups: the farmer's physical and financial capital endowment class and the intensity of the land use activities. Poor farms of poor farmers had strengths of low opportunity costs of family labour and being prioritised by the state for support, and weakness of dependence on external support due to lack of physical and financial capital. The opposite suffices for better-off farms, of better-off farmers, with either intensive or extensive land use activities. Farms dominated by capital-extensive activities of rainfed crops and ruminants on natural pastures had the strengths of needing less capital investment, as less input from the markets was required, and moderate susceptibility to climate change, as arable activities depended on weather predictions.

Furthermore, capital-extensive farms had a low possibility for partnerships with large-scale commercial farmers. The opposite suffices for farms dominated by capital-intensive activities of irrigated horticulture and in-door monogastrics. Two futures for land reform farms are high production on better-off farms and improved production on poor farms. High production depends on the state's ability to leverage private finance for better-off farms. In contrast, the improved production in poor farms will solely depend on financial support from the state. Lastly, these desired futures (high and improved production) of land reform farms will be realised if the availability of financial support to farmers is coupled with the adoption of climate-smart agricultural practices.

Access to external financial support could lead to improved and high production levels in land reform farms, resulting in significant contributions of the gained land ownership and access to job creation, poverty alleviation, and equalities in households' income.

5. Recommendations

The following recommendations emanate from this study.

- Management of livestock diseases and pests in arable farming should be prioritised.
- Land reform farms should be grouped according to their physical capital endowments to provide them with appropriate support.
- The state must support poor farmers and leverage private investments for better-off farmers.
- The state must ensure that farmers adopt climate-smart agricultural practices by including such as a critical priority among the criteria for accessing its financial support.

Funding

This work was supported the Netherlands University Foundation for International Cooperation (NUFFIC, project NICHE/ZAF/012); the University of Venda; and Wageningen University & Research.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

We appreciate the willingness of farmers of the Waterberg District municipality who participated during the survey and the workshop. Further, the contributions made by representatives of the local and district municipalities, the Limpopo Department of Agriculture, the then Department of Rural Development and Land Reform, the African Farmers Association of South Africa, and the Waterberg District Communal Association forum are appreciated. The authors acknowledge the invaluable contributions of the anonymous reviewer to this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssaho.2023.100482.

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