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Book

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QUANTIFYING THE ECONOMIC EFFECTS OF LAND REFORM POLICY IN SOUTH AFRICA: A COMPUTABLE GENERAL EQUILIBRIUM ANALYSIS

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Abstract

Although South Africa has implemented several land reform policies and farmer development support programmes, little progress has been achieved in bridging the inequality gap between mainly black emerging and mainly white established farmers. This study seeks to quantify the effects of land reform policy in South Africa using a dynamic computable general equilibrium (CGE) model. The study simulates two policy scenarios. The first policy scenario assumes that the current land reform approach will continue where government transfers land, but without transitional farmer support to improve the productivity of new farmers. The second policy scenario assumes that the state will additionally allocate transitional farmer support to new farmers, including those operating on land-reform farms and in the former homeland areas.

The results reveal that the effects of land reform policy are minimal but positive at the aggregate economic level across the two scenarios. Achieving a land reform target of 30% will benefit the real GDP by R242.4 million under scenario 1 and R608.6 million under scenario 2 by the end of the simulation period. There is also a positive effect on selected macroeconomic indicators such as imports, employment, and investment, notably when comprehensive support services are provided. Primary industries like field crops, horticulture, and livestock experience significant output gains. Similar to industrial output, exports for the primary agricultural industries are impacted positively in the long term as new land is made available, making more output available for the export market.

Although the implementation of land reform might be a costly exercise initially, it can be achieved at a lower cost than what is assumed or expected. Simulation results suggest that land redistribution will not harm the economy if accompanied by comprehensive farmer support. The study recommends that the government and the private sector work together to create a just and inclusive agricultural landscape.

Keywords: Productivity, Land reform policy, Computable General Equilibrium modelling.

JEL codes: Q15, C68.

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1 INTRODUCTION

Since 1994, South Africa has implemented several land reform policies, yet according to official figures, little progress has been achieved in bridging the inequality gap between mainly black emerging and mainly white established farmers[4]. Furthermore, a number of farmer development support programmes have been implemented, but again, without yielding desired outcomes. Therefore, although vital, it is clear that the success of the land reform programme is being hampered by a breakdown of multiple policy plans, ineffective implementation, and ultimately very minimal positive impact on those that the programme intends to benefit and support. Against this backdrop, this study focuses on the land reform programme in South Africa and the potential economic effects and benefits thereof.

In order to address the challenges associated with land reform policy, a number of technical and non-technical features of the agricultural value chain need to be assessed in the broader context of the South African economy. For example, policymakers need to understand the production structure of the South African agricultural sector as well as the factors underpinning an effective and sustainable agricultural production system that helps create decent jobs and ensure food security in the country. Moreover, to effectively analyse the challenges related to the land reform programme, a consistent set of stylised facts must first be established. This will allow for accurate and credible modelling of factors impacting the analysis of the programme, most notably, productivity differences related to transferred land, farmer support and the extent of physical land in question.

Building on the research related to productivity in the agricultural sector by Liebenberg (2013); Sihlobo and Kirsten (2021); and extensions thereof as reported by Mosoma, Van Eyden and Bohlmann (2023), this paper aims to quantify the economic effects of land redistribution on the South African economy, explicitly taking into account the productivity gap of transferred land to new or emerging farmers, alongside the identified transitional support required, using a dynamic computable general equilibrium (CGE) model. The outcomes of this work will serve to inform policymakers and other stakeholders on improving the execution of the land reform programme and meet its intended expectations.

The rest of the paper is organised as follows: Section 2 contextualises the land reform programme and presents stylised agricultural production facts. This is followed by a review of selected land reform studies that assessed failures of the programme as well as those that explored different land reform approaches for the country in section 3. The fourth section discusses the CGE methodology, including

[4] The following terminologies are used interchangeably when referring to the following two groups: (i) *Established farmers* refers to persons that were farming prior to 1994 and are well established in terms of production technology, farm infrastructure, market access, and land tenure. They often farm on medium to large scale farm units. This group of farmers operate on a commercial basis and are predominantly white farmers. (ii) *New or emerging farmers* refers to persons that commenced farming post-1994, including beneficiaries of the land reform programme and subsistence farmers operating in rural and tribal areas. They often farm on a small-scale farm unit. This group of farmers is dominated by black farmers, where black include African, Indian, Coloured and Asian population groups in South Africa.

the simulation design and model closures. The simulation output and interpretation of the results are provided in section 5, while conclusions and recommendations form the final part of the paper.

2 CONTEXTUALISATION, STYLISED AGRICULTURE AND LAND REFORM FACTS

Agriculture is considered a strategic and critical sector for economic development in South Africa. The sector creates job opportunities for low to semi-skilled people in rural and farming areas, employing an average of 843 177 people per annum between 2018 and 2022, which is equivalent to 5.4% of total employment in South Africa (Stats SA, 2022b). The contribution of the agricultural sector to Gross Domestic Product (GDP) has gradually declined over time, dropping from 9% in 1960 to 3.4% in 1994 and a further decline to 2.5% in 2021 (World Bank[5], 2023; Stats SA, 2023). This decline in the agricultural sector's contribution is consistent with Economic Development theory, which posits that the share of the primary industry diminishes as the economy develops, shifting towards secondary and tertiary sectors – industry and the services sector contributed 24.5% and 63.02% of the total value added in 2021, respectively (Stata SA, 2023). Despite the falling share in GDP, during the 28-year period starting in 1994, agricultural output doubled in real terms (SARB, 2022). The agricultural sector continues to play a major role in the country's rural development, foreign earnings and employment creation agenda (Bennett et al., 2003; Fuglie & Rada, 2013).

In line with a developing economic state, the country's agricultural sector has undergone a series of structural changes since 1994, including a shift towards higher-yielding agricultural varieties, an adaptation to climate change, and the utilisation of modern farm machinery and irrigation technologies. Moreover, the liberalisation of trade policy resulted in the removal of agricultural subsidies. Essentially, the sector went through a deregulation process in the mid to late 1990s, thus ascribing to principles of a free market system. As a result, efficiency, terms of trade and farm profit improved significantly in the past three decades. Even though overall productivity has slowed compared to previous periods illustrated in Table 1, the sector has recorded positive growth in terms of jobs, exports, and output.

Table 1: Growth rates (% per annum) per developmental stage in South African agriculture

Indicator	The big push in agriculture: 1945-1970	Subsidised production: 1971 – 1988	Deregulation era: 1990-2010
Output index	4.52	2.54	1.34
Input index	3.38	-0.93	1.38
TFP index	1.14	3.47	0.04
Farm profit	2.54	-1.06	3.02
Terms of trade	0.02	-2.63	0.44

Source: Vink et al. (2022); Liebenberg (2013) and Liebenberg et al. (2015).

[5] https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=ZA.

Some of the factors impacting overall productivity in the deregulation era are the removal of subsidies, weakening of biosecurity controls, ageing irrigation infrastructure and the introduction of the land reform programme aimed at correcting injustice caused by historical laws of excluding black persons in the formal agricultural economy (Liebenberg, 2013; and Sihlobo & Kirsten, 2021). The need to create a just and inclusive agricultural landscape compelled the democratic government post-1994 to introduce a land reform programme through the White Paper on Land published in 1997 (DLA, 1997). Subsequent to the land reform programme, the state introduced a comprehensive agricultural support programme (CASP) in 2004 to support new farmers with access to agricultural inputs and markets, thus enhancing their ability to maintain the productivity of transferred land. For updated figures for output and TFP covering the post-deregulation era, refer to Mosoma, Van Eyden and Bohlmann (2023).

From Table 1, it can be deduced from input and output indices that farmers have gained more efficiency in the deregulation era. Farmer efficiency gains are supported by DALRRD (2022) production data. For example, DALRRD (2022) shows that the total area planted with maize decreased from 4.1 to 2.9 million hectares between 1996 and 2021. However, maize output in this area increased from 10 to 15.3 million tons, while yield per hectare has increased by 103% over the past 25 years. Similar efficiency increases are observed in the horticultural subsector, where production and export volumes in citrus, table grapes, wine and avocado industries have increased between 75% and 110% over the past 25 years.

2.1 Understanding the South African land reform programme

The South African land reform programme was introduced in 1994 and comprises three pillars: redistribution, restitution, and land tenure. Regarding the restitution pillar, the government compensates (monetary or land) individuals forcefully removed by historic laws such as the Land Act of 1913. The redistribution pillar focuses on acquiring land for agricultural production, housing settlement, and non-agricultural purposes. Land tenure is about providing people with better security on land they occupy, in particular farm workers and labour tenants. In 1994, the South African democratic government set a target of 30% in the transfer of commercial agricultural land to previously disadvantaged individuals. This target was based on the 1996 agricultural census, which showed that there were 82 209 571 hectares of agricultural land, equivalent to 67% of the total surface area in the country. The 30% target is equivalent to 24.5 million hectares, which was supposed to be attained by 2014 through a willing seller, willing buyer transactional model. The target was reaffirmed in 2014 in the National Development Plan (NDP), and government committed to transfer 16.4 million hectares by 2030.[6]

[6] In this regard, also see the analysis Kirsten and Sihlobo (2022), https://theconversation.com/land-reform-in-south-africa-5-myths-about-farming-debunked-195045.

Between 1994 and March 2022, the government managed to transfer a total of 9.2 million hectares to black persons under the land reform programme. Approximately 5.2 million hectares were transferred through the land redistribution pillar. According to DALRRD (2022), the 5.2 million redistributed land include the 2.3 million hectares acquired through the Proactive Land Acquisition Strategy (PLAS) that started in 2009. The PLAS programme allows the state to procure and lease land to black farmers instead of fully transferring it to beneficiaries (Antwi & Nxumalo, 2014). The remainder of the 9 million hectares has been acquired through the land restitution and tenure security pillars.

An assessment of land reform farms conducted jointly by the Agricultural Research Council and Entsika Consulting (ARC, 2019) found that 68% of the land acquired is suitable for animal grazing, and the rest is suitable for crop production. Of the land considered suitable for crop farming, only 15.7% is classified as high-potential land. The rest of the cropland requires extensive support and access to water. The ARC (2019) study also found that 87% of all transferred land to reform farms was transferred without associated water rights, which limits the ability of new farmers to maintain land productivity. Despite the land reform challenges, the Bureau of Food and Agricultural Policy (BFAP) (2022), Vink *et al*. (2022), and Sihlobo and Kirsten (2021) show that the agricultural sector has performed relatively well in terms of production, exports, and employment growth. BFAP (2022) further projects a positive agricultural outlook; however, it identifies weaker biosecurity control, ageing irrigation infrastructure, and limited export opportunities as risk factors that hamper future growth.

The land audit undertaken by the then Department of Land Reform and Rural Development (DRDLR, 2017) and later supported by two advisory panels headed by Motlanthe (Parliament of the Republic of South Africa, 2017) and Mahlati (The Presidential Advisory Panel, 2019), showed that the land reform programme has managed to transfer 10% at the cost of R44 billion since 1994. This includes the 2.3 million hectares of PLAS farms acquired at R12 billion, as illustrated in Table 2. This implies that an additional 15 million hectares of agricultural land must be transferred in the next ten years to meet the NDP target of 24.5 million (DALRRD, 2022). According to DALRRD (2022), based on the historic land acquisition transactions by the DALRRD, the government must acquire an average of 1.5 million hectares per annum at an estimated cost of R11 billion per year up to 2032.

According to DALRRD (2022), the official figure of land transferred by March 2022 is 10%, which is equivalent to 9 million hectares. However, Sihlobo and Kirsten (2021) estimated a higher transfer rate of 17%. The main difference between the two estimates is the approach followed, where Sihlobo and Kirsten (2021), over and above land reform acquisition, included private transactions (i.e., land acquired using private funds) and cash transfers (i.e., cases where beneficiaries opted for cash instead of receiving land for restitution purposes). The current study is, however, first and foremost concerned with the productivity differences of the transferred land and their implications on the economy rather than the most accurate figure of transferred land.

Table 2: Land reform progress and targets

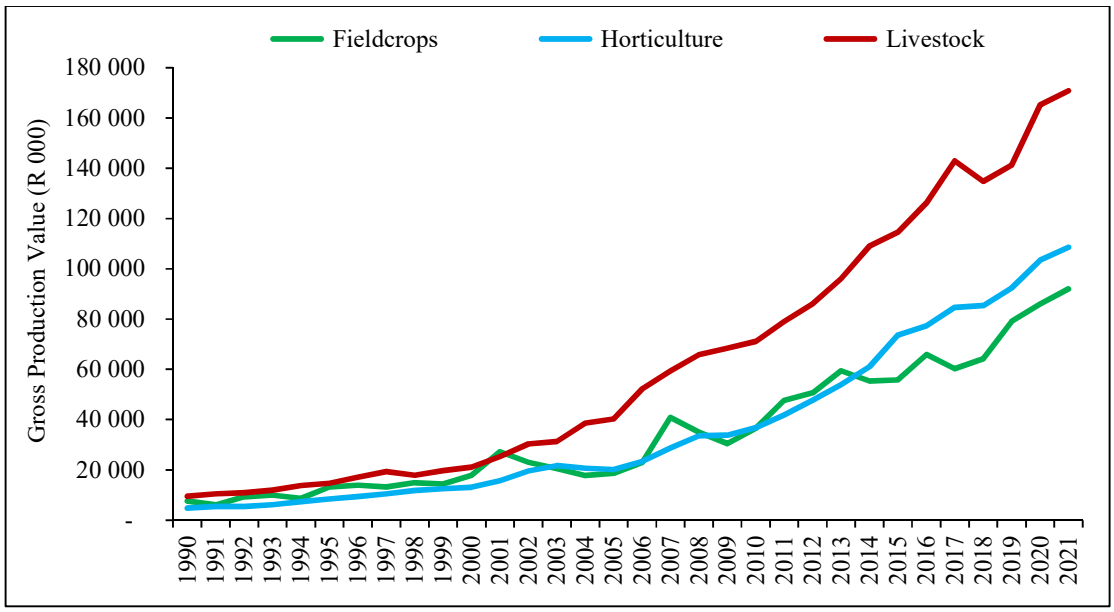
Indicator	Data	Decomposition
South Africa's total land size	122 million hectares	82 209 571 ha commercial agricultural land 39 790 429 ha protected, tribal and developed land
Commercial Agricultural land vs. non-agricultural land	Agriculture land: 82 209 571 ha Other land: 39 790 429 ha	**of 82 209 571 ha commercial agriculture land** 68% grazing or mixed farming (animal production)* 14% arable agricultural land (crop production) 11% nature and forest reserves (protected land) 7% other land development (irrigation and others) **of 39 790 429 ha non-commercial agricultural land** 16 035 593 ha former homelands, considered state land 8 800 000 ha protected areas, considered state land 5 635 593 ha other government land 9 319 243 ha privately owned/used land
Land reform target and progress made	30% of commercial agriculture land = 24 562 871 ha 10% transferred to date = 9 million ha, including PLAS land Outstanding: 15 million ha	**9 046 295 ha (10%) transferred by March 2022** Redistribution: 5 231 115 ha at R20 billion Restitution: 3 815 080 ha at R24 billion Redistribution includes 2 300 000 ha of PLAS at R12 billion **of outstanding: 24 562 871 ha** Government needs to acquire 1.5 million ha at R11 billion per annum to achieve the target.

Source: own calculations based on data from DALRRD (2022), the Presidential Advisory Panel (2019) and the Parliament of the Republic of South Africa (2017).
**Includes land that is not actively managed and those under mixed-agricultural production.*

2.2 South Africa's agricultural production structure and performance

Using a coherent and consistent classification, the Standard Industrial Classification (SIC) of all economic activities, agriculture is defined as activities of growing crops, breeding and raising of animals, harvesting of plants, animals or animal products from a farm or their natural habitat. According to DALRRD (2022), South African agricultural output has more than doubled between 1994 and 2021, driven mainly by investment in commercial agriculture such as fruits, grains, oil, seeds and nut production. Figure 1 illustrates the agricultural growth at the sub-sector level, where livestock farming contributed an average of 48% share in agricultural value added, followed by horticulture at 27% and field crops at 25% between 2015 and 2021 (DALRRD, 2022).

Figure 1: Agricultural production value per sub-sector between 1990 and 2021



Source: *DALRRD (2022)*

From Figure 1, it is clear that the structure of the agricultural sector has remained relatively unchanged over the past three decades, where animals and animal products contribute the largest share (48%) to total agricultural output. The rise in export opportunities to Asia and Eastern European markets has also promoted a demand-led production of horticultural products such as citrus, apples, avocados, and table grapes. The dominance of livestock in the country is supported by land and soil types, where more than 68% of commercial agricultural land is only suitable for animal grazing.

While impressive, it is argued that agricultural growth since 1994 could have been substantially more inclusive had the transfer of land to black farmers been faster and farmer support been more comprehensive over the past three decades. The commercial involvement and contribution share from black farmers remains very low, especially in the case of field crops and horticulture. In the livestock sector (especially beef and goats), black farmers contribute a significant share of output, but the bulk of black-owned livestock do not reach the commercial value chains and tend to struggle to access markets. The NAMC (2019) estimates that the overall contribution of black farmers to total agricultural output is 10% if averaged out among all agricultural industries, which include new farmers that benefitted from the land reform programme and established black farmers that acquired land through private means.

Table 3 provides a share contribution of new and established farmers. The majority of new farmers are black persons who have benefitted from the land reform and other government programmes, including those operating in former-homeland areas. On the other hand, white farmers dominate the established farmer cohort. The limited contribution of new farmers to agricultural production is partly influencing

the calls for faster land redistribution and better farmer support programmes. However, any unorderly land redistribution will likely impact agricultural productivity, thereby exacerbating food insecurity.

Table 3: Stylised facts of agricultural output and employment

Indicators		New farmers	Established farmers
Share in agricultural output	**Aggregate**	**10%**	**90%**
	Field crops	*12%*	*82%*
	Horticulture	*8%*	*92%*
	Livestock	*34%*	*66%*
Allocated agricultural water rights (%)		5%	95%
Agricultural employment	**Aggregate**	**161 312**	**681 865**
	Field crops	56 419	191 785
	Horticulture	32 261	412 564
	Livestock	72 632	77 516

Source: Own calculations based on data from NAMC (2019); NAMC (2021), DWS (2022), and Stats SA (2022b).
Note: New farmers are predominantly black, while established farmers are largely white.

Total agricultural employment has fluctuated, recording an average of 843 177 jobs over the past five years. Changes in agricultural jobs could be attributable to the mechanisation that replaces human labour in livestock and field crop operations. However, market forces and minimum requirements for fruit handling tend to promote the absorption of human labour in fruits and nut production. Combining these subsector dynamics and the seasonality effect, overall agricultural employment has averaged 840 000 workers and is likely to remain at this level in the short to medium term (Stats SA, 2022b).

2.3 Agricultural land ownership patterns and productivity gap

As stated, South Africa's agricultural sector comprises established and new farmers. Established farmers are typically predominantly white and own relatively large quantities of land, whereas the latter category is dominated by black persons that own and farm on small quantities of land. These structural imbalances were caused by laws such as the Land Act of 1913, the Marketing of Agricultural Products Act of 1936, and the Cooperative Societies Act of 1925, amongst others. According to Khapayi and Celliers (2016), Commey (2013), Magingxa *et al.* (2009), and Ortmann and King (2007), land inequality in the country is considered the gravest injustice and social-economic problem facing South Africa, which the democratic government has not succeeded to address adequately. Table 4 shows the total number of farm units in the country. Moreover, the table provides the ownership patterns of land in South Africa based on the estimates and land audits conducted by DRDLR (2017) and Agri SA (2017).

Table 4: Commercial agricultural land ownership by population group

Indicators	Study Source	Black[a)]	White[a)]
Percentage agricultural land ownership[b)]	DRDLR, 2017	28%	72%
	Agri SA, 2017	27%	73%
Total number of farms	Stats SA, 2019	2 610 122	58 381

***Source**: Own calculations based on data from DRDLR (2017), Agri SA (2017), and Stats SA (2019).*

***Notes:** a) Black refers to Black, Coloured and Indian racial groups, whereas White refers to only the white population group; b) Agricultural land allocated under Black includes state-owned land and former-homeland areas (tribal land).*

Liebenberg (2013) estimated the productivity gap between established and new farmers in the maize industry. He found that new farmers, who are predominately black, farming on land-reform farms and in rural areas, had a productivity gap of 67% relative to established farmers. In other words, new farmers only achieve 33% of yield per hectare relative to the yield achieved by established farmers. BFAP (2022) also reports a similar productivity gap between new and established farmers. Their assessment indicates that established farmers, on average, achieved 5.8 tons of maize per hectare, while new farmers only managed to attain 1.8 tons per hectare between 2017 and 2019.[7] The factors constraining the productivity of new farmers include limited access to high-potential land and lack of transitional farmer support (e.g., low agricultural skills, poor access to markets, water rights, and production inputs like fertiliser etc.). Table 5 shows how the productivity gap between new and established farmers s changed from 1950 to 2020.

According to Liebenberg (2013), yields obtained by new farmers were 39.9% of the average achieved by established farmers in 1954. This was the period before full implementation of the apartheid regime, and black farmers were still receiving some form of support in rural areas. The introduction of the Marketing of Agricultural Products Act of 1936 and 1968 and other subsequent legislations enhanced apartheid government involvement in the marketing of agricultural products and gave rise to Marketing Control Boards, entrenching the exclusion of black persons. As a result, over the subsequent decades, the productivity gap increased to 73.7%, whilst the productivity of new farmers decreased to 26.3% per ha in 1964. With the dawn of democracy in 1994 and the introduction of land reform and other policies, the productivity of new farmers improved to 51.6% between 1990 and 2009. However, the poor implementation of these reforms decreased the productivity of new farmers again, down to 24.5% in 2008, thus, to some extent, maintaining a dual agricultural economy in the country. BFAP (2022) reports an updated value for the productivity of new farmers of around 31% for the period 2017 to 2019. Sihlobo and Kirsten (2021) attribute the foundations for the dualistic nature of the agricultural sector to colonial rule and segregationist laws of the apartheid regime in South Africa, while the democratic government that came to power in 1994 has largely failed to address the issue.

[7] The productivity gap is determined as 100% – [1.8/5.4*100] % = 100% – 33% = 67%.

Table 5: Structural and productivity changes in South African agriculture

Indicator	1910-29	1930-49	1950-69	1970-89	1990-2009	2010-2019	2020-
Share of production: Rand value							
Livestock	55%	50%	55%	36%	37%	50%	45%
Field crops	33%	36%	34%	47%	49%	24%	26%
Horticulture	12%	14%	11%	17%	14%	26%	29%
Former homeland and/or tribal land: Hectares							
Total land	n/a	n/a	n/a	**16 035 593**	**16 035 593**	**16 035 593**	**16 035 593**
Land suitable for agricultural production	2 693 980	n/a	n/a	2 533 624	2 469 481	4 954 998	4 329 610
Actual utilised Agricultural land	*732,762*	*n/a*	*n/a*	*708 829*	*75 316*	*623 464*	*394 254*
Other use	n/a	n/a	n/a	13 501 969	13 566 112	11 080 595	11 705 983
Commercial agricultural land per subsector: Hectares							
Total land	**81 015 000**	**85 656 550**	**88 703 050**	**89 216 000**	**82 209 571**	**82 209 571**	**82 209 571**
Livestock	74 778 748	75 575 756	78 297 783	78 147 781	70 455 705	73 408 734	72 087 377
Field crops	2 525 051	6 705 134	7 397 148	9 114 182	8 120 162	6 078 778	5 714 374
Horticulture	154 005	419 013	640 019	1 225 037	1 485 045	1 644 049	2 137 264
Non-active managed	3 557 196	2 956 647	2 368 100	729 000	2 148 659	1 078 010	2 270 556
Production costs per subsector: Nominal Rand per hectare							
Livestock	n/a	n/a	n/a	n/a	5 005	7 700	11 000
Field crops	n/a	n/a	n/a	n/a	69 160	106 400	152 000
Horticulture	n/a	n/a	n/a	n/a	268 450	413 000	590 000
Productivity gap between new (mainly black) and established (mainly whites) farmers: Ton/hectare							
Productivity gap: % measured as yield (ton/ha) by new farmers (mostly black) relative to the average achieved by established farmers (largely white)	n/a	n/a	60.1%	73.7%	48.4%	75.5%	67%

Source: Adapted from Liebenberg (2013), BFAP (2022) and DALRRD (2022).

Note: Since 1996, the agricultural census has not updated the total agricultural land, hence the constant total of 82 209 571 ha.

Within the agricultural sector, the apartheid regime laws largely supported field crops over and above horticulture and livestock. One of the reasons is that field crops contribute directly to food security, followed by livestock. As shown in Table 5, the share of field crop to agriculture output increased from 34% in the 1950-60s to 47% in the 1970-80s. The substantial government subsidies and focus on field crops resulted in land under field crops, increasing from 6.7 million hectares in the 1930-40s to 7.4 million hectares in the 1950-60s and 9.1 million hectares in the 1970-80s. With the removal of subsidies and closure of the Control Boards in 1996, land under field crops dropped to 8.1 million hectares between 1990 and 2019 and has been gradually declining, reaching 5.7 million hectares in 2020 (see Table 5).

As evident in Table 5, the horticulture industry has benefitted the most under the democratic era. This is due to the deregulation of the market and the liberalisation of trade in 1995 when South Africa joined the World Trade Organisation (WTO). This expanded export opportunities for wine, citrus, table grapes, apples and other horticultural products to markets in Europe, Asia, and the United States of America. Scholars like Vink *et al.* (2022) argue that some of the reform started in the 1980s, leading to the

formation of the Kassier Commission in 1992, which eventually recommended a shift from regulated to deregulated agricultural markets. The land area under horticulture grew from 640 000 hectares in the 1960s to 1.22 million hectares in the 1970-80s. Land under horticulture continued to grow under deregulation, reaching 1.4 million hectares between 1990 and 2009 and gradually increasing to 2.13 million in 2020. With the high unemployment rate in South Africa, horticulture is also seen as a labour-intensive sub-sector, and hence, it has been attracting government support. BFAP (2022) estimate that between 2012 and 2021, horticulture has attracted more than R80 billion invested in new orchards and vineyards of fruits and nuts.

Table 5 also shows agricultural production in the former homeland areas. A total of 16.04 million hectares, equivalent to 13% of the country's total land, are former homeland areas. Of these former homeland areas, approximately 22% (around 4.9 million hectares) is suitable for agricultural production. According to Liebenberg (2013), on average, farmers only use 619 927 hectares (about 20%) of agricultural land in former homeland areas for crop production, while the rest is used for animal grazing or other purposes. The lack of enabling infrastructure like irrigation schemes, roads and electricity is among the reasons limiting production in the former homelands. This is exacerbated by markets being located far away from these areas.

An important statistic reported in Table 5 is the nominal cost (establishment and operational) of production for different agricultural sub-sectors. While livestock farming accounts for 80% of commercial and former homeland agricultural lands, the total production cost is low. BFAP (2022) measures the total production cost for livestock at R11 000 per hectare per year, which mainly refers to the cost of purchasing the animal, vaccination programmes and feed, in particular winter months when grazing fields are dry. The production costs for field crop products like maize, soybean, wheat, and sunflower are estimated at an average of R152 000 per hectare per annum. The production cost for horticultural products such as fruits and vegetables averages R590 000 per hectare per year due to the high costs of installing irrigation systems, as well as the fact that it must meet stringent domestic and export market standards, in for example, in the use of trellis infrastructure like nets and greenhouses.

Despite the technological advances, food production costs have more than doubled in the past 30 years – attributed to increased input costs such as fertiliser, crude oil (diesel or petrol), machinery, feed and agrochemicals, amongst others. According to NAMC (2022a), fertiliser prices have increased between 40% and 170%. The secondary elements of food production involve the movement of produce from the farm to the warehouse, processing and packaging, and delivery to the retail outlet. Distance, a connection of the roads, and road conditions all factor into the final cost that the consumer ultimately pays. In November 2022, consumer inflation in South Africa decreased to 7.4% but remained extremely high at 12.8% for food, 8.3% for electricity, and 25.3% for fuel (Stats SA, 2022; NAMC, 2022b). As a result of the increases in all input costs in producing a litre of milk, a consumer in South Africa bought it at R9,72 in January 2010, but this price increased to R17,90 in November 2022. This represented an

increase of 84% during this period, whilst brown and white bread prices increased by 140% and 139%, respectively, during the same period.

3 LITERATURE ON LAND REFORM

Irrefutably, land is a vital economic resource and a motive topic in many developing countries, including South Africa. Access to land by rural and peri-urban households is seen as an opportunity to alleviate poverty and generate income. Typically, subsistence and small-scale commercial farmers use small plots of land, about one to three hectares, allocated to them by traditional leaders to produce their own food or to supply to informal markets. (Binswanger-Mkhize, 2014; Mukarati *et al.,* 2020). Most black farmers and rural households believe that access to large-scale commercial farming land could uplift their economic status, enabling them to play a meaningful role in the formal economy. Equitable access to land, in particular commercial farming land, is seen as an instrument to restore the dignity of black South Africans and promote inclusivity in the agricultural and food sectors.

As stated earlier, the democratic government elected in 1994 has been addressing the land inequality problems by implementing a land reform programme to transfer 30% of commercial agricultural land to black beneficiaries with an aim of increasing their land ownership. Under the land reform programme, the first redistribution instrument used in the mid-to-late 1990s was the Settlement Land Acquisition Grant (SLAG). This instrument was replaced by Land Redistribution for Agricultural Development (LRAD) in 2001. However, LRAD was also slow in transferring land and was not aligned with the government's farmer support programme, leading to land reform farms not receiving adequate support post the settlement process. Another challenge with SLAG and LRAD was that the transferred farms defaulted on credit and financial institutions repossessed the land, thereby regressing the gains of the land reform. To address these issues, government introduced the Proactive Land Acquisition Strategy (PLAS) in 2006 to improve land redistribution through the state procuring the land and leasing it to black farmers (Antwi & Nxumalo, 2014). The following subsections review the empirical studies that have measured the performance of land reform under the three aforementioned redistribution instruments, namely SLAG, LRAD and PLAS.

3.1 Assessing the failures of land reform in South Africa

Aliber (2015) shows that South Africa has followed a market-friendly approach in redistributing land to black people, according to a "willing seller, willing buyer" model. The implementation of this approach has encountered multiple challenges, including bureaucratic impediments, inadequate funding to purchase land at market prices, inflated land prices by the private sellers, unwillingness of land owners to sell, and maladministration by government officials (Boudreaux, 2010; Kepe & Hall, 2016; Akinola, 2020). The policy changed from the state procuring the land and transferring the title deed to

land beneficiaries to acquiring land and leasing it to the beneficiaries, a decision that has exacerbated the lack of access to credit for black farmers.

Kirsten and Machete (2005) also argue that the low allocation of the public budget to land reform, coupled with uncoordinated support to settled farmers and poor infrastructure in transferred farms, are the main factors impacting the success of the land reform programme in the country. As such, the productivity levels of land reform farms deteriorate once transferred to black farmers. The sustainability and productivity of the redistributed land became questionable when it comes to improving beneficiaries' livelihoods (Ntsebeza & Hall, 2007; Manenzhe *et al.,* 2016). Moreover, Cousins (2016) argues that a lack of government capacity in land evaluation and negotiating skills contributes to land reform failure and causes distortions in the land market.

Corruption and maladministration also impeded the success of land reform in the country. The study by Hall and Kepe (2017) highlights the elite capture and state collusion with agribusiness whereby projects were started, farms were acquired from the state and workers who had no control of the land, capital and production were signed up as beneficiaries. May *et al.* (2002) identified high poverty levels amongst land reform beneficiaries attributed to their lack of participation in project management and funds utilisation, thus exposing the projects to corruption and fund mismanagement. Mathiba (2021) cited the abuse of political power and lack of political will as the main drivers of land-related corruption in South Africa, consequently proposing good governance and strengthening the anti-corruption mechanism.

The above studies show that land reform programmes failed to address poverty and land inequality in the country. The persisting land inequality and slow land reform programme resulted in some parts of society calling for more radical land reform programmes. An example of these radical policies is the proposal to expropriate land without compensation (explored in more detail in the following sub-section). In essence, the growing policy debate advocates for more inclusivity in the land market by ensuring equitable access to productive land for farming purposes. Collaboration between public and private stakeholders is highly recommended to improve access to resources and services and enable productive and sustainable land use.

3.2 Land reform policy direction

According to Cousins (2016), 80% of the land purchase target can be met in two decades provided the budget is increased, thus resolving the "destabilising land question". Kepe and Hall (2018) proposed a radical shift and implementation in policy in order to realign the decolonisation project in South Africa. Vin and Kirsten (2019) underscore the importance of fast-tracking land reform through the "state incentivised, but private sector delivered process of land redistribution", whereby the private sector donates the bulk of the land, funds, production inputs and skills acquired from the unjust past. This model will create a farmer support framework and environment that enable new land users to establish themselves successfully in the agricultural sector, thereby improving equity in land ownership.

Noting the disappointment of the "willing seller, willing buyer" approach, some political parties in the country have proposed "Land Expropriation Without Compensation" (LEWC) as an approach that would fast-track land redistribution and address the disparities in land ownership. This approach is not new and was implemented during the pre-democracy era through the Native Land Act of 1913 (Mubecua & Mbatha, 2021). According to Shangase (2007), land expropriation during the apartheid era contributed to the country's economic growth performance. However, LEWC does not provide any guarantee of the expected land justice and economic growth outcome (Mubecua & Mbatha, 2021). LEWC is seen as a coverup of the government's failure to eradicate poverty, poor service delivery, poor economic performance and housing problems (Akinola, 2020). The study further states that LEWC might struggle to distribute the land efficiently and equitably to the poor and reduce poverty; instead, it might be a suitable land allocation mechanism for new black elites.

Mukarati *et al.* (2020) recommend minimal land redistribution, but increased government investment and government support in order to reduce the negative impact of land redistribution whilst maintaining agricultural productivity. Akinola (2020) points out that as much as there are convincing reasons to securitise land policy change, it cautions against the adoption and implementation of LEWC. The intensifying public debate on land reform aligns with the National Development Plan that showed the agricultural sector could potentially create 1 million jobs if land reform is accelerated and farmer support is provided. This study's outcomes are anticipated to contribute to the empirical literature by using a dynamic CGE model to unpack the impact and effects of land reform in the South African agricultural sector.

4 METHODOLOGY

This study uses a MONASH-style dynamic computable general equilibrium (CGE) model to conduct various policy simulations. The theoretical specification of a MONASH-style CGE model is documented in Dixon and Rimmer (2002) and Dixon et al. (2013) and is solved using the GEMPACK solution software discussed in Horridge et al. (2013). Specifically, the University of Pretoria General Equilibrium Model (UPGEM), modified for policy simulations to address research questions in agriculture and described in Ntombela et al. (2019), is applied in this study. The modified UPGEM version, together with the disaggregated South African agriculture and agro-processing sectors described in Ntombela *et al*. (2019), is used to quantify the socio-economic effects of the land reform programme in South Africa. Following Ntombela *et al*. (2019), the primary agriculture sector is decomposed into five industries: grains, horticulture, livestock, fisheries, and forestry. The food sector is decomposed into beverages, meat, dairy, cereals, sugar and other food. The rest of the economic sectors in the database are as classified and described in Bohlmann *et al*. (2015).

The core UPGEM model and database discussed in Bohlmann *et al*. (2015), Dixon *et al*. (2013) and Dixon and Rimmer (2002) explain that the demand and supply equations of the model are derived from

the solution to the optimisation problem. The model equations underlie the behaviour of private sector agents in conventional neo-classical microeconomics. Each industry minimises cost subject to a set of given input prices and a constant return-to-scale production function. Zero pure profits are assumed for all industries. Households are designed to maximise a Klein-Rubin utility function subject to their budget constraint. Units of new industry-specific capital are constructed as cost-minimising combinations of domestic and imported commodities. The export demand for any locally produced commodity is inversely related to its foreign-currency price. Government consumption is typically set exogenously in the baseline or linked to changes in household consumption in policy simulations, and taxation details are also recognised in the model (Bohlmann *et al*., 2015; Dixon *et al*., 2013). The UPGEM data structure is underpinned by the data in the Supply and Use Tables published by Statistics South Africa and modified to take advantage of the model's detailed theoretical structure as described in Roos *et al*. (2015).

4.1 Simulation design and model closures

Based on land figures discussed in Table 2, it is evident that the state would need to transfer an average of 1.5 million hectares of land for the next decade to achieve the 30% land target that was set in 1994. According to DALRRD (2022), this will cost the state an average of R11 billion per annum for the next ten years and need to be adjusted for inflation in the coming years to align with land market prices. This study assumes that the land reform programme will continue to be implemented using a market-friendly approach whereby government purchases the land from farmers based on the "willing buyer, willing seller" principle. The expropriation of land without compensation is not considered an option for government. Parallel to the land reform programme that aims to correct historical injustices by redistributing privately owned land, mainly by white farmers, there is also a need to address the underutilised land in the former-homeland areas. Liebenberg (2013) found that up to 5 million hectares of former homelands are considered good agricultural land, of which only 22% is utilised for production. In this study, we argue that both land and agrarian reforms are essential for an inclusive growth path that will make commercial farming and former homeland areas competitive and contribute to job creation and rural development in the country.

In the context of this study, land reform refers to the redistribution and restitution to redress and promote equitable access to land. Agrarian reform refers to developing former homelands and/or tribal land administered by various traditional councils in the country. We formulate two policy scenarios to estimate the effects of a successful land reform programme and assess the long-term benefits of the land reform on the overall economy. Table 6 shows the assumptions that inform the two policy scenarios developed in this study. In the first policy scenario, we assume that the current land reform approach will continue in the next ten years, where government purchase and transfer land to selected beneficiaries; however, the newly settled farmers are not provided with the transitional farmer support required to maintain and improve land productivity. In this scenario, we add a new assumption that

underutilised or unused former homelands agricultural land will also be brought to production by previously disadvantaged farmers who strive to participate in the formal agricultural economy. Again, we assume these previously disadvantaged farmers do so without state support; hence, their productivity relative to established farmers (mainly white) is significantly low.

In the second policy scenario, we assume there will be a significant shift in the execution of land reform in the next ten years. We assume the state will recognise the importance of allocating land to new farmers together with the required transitional farmer support. Moreover, we assume that the state will also recognise the efforts of previously disadvantaged farmers in the former homelands; thereby, the government will also contribute in the form of on-farm and off-farm support. On-farm support mainly relates to skill development and biological materials such as animals, crops and other inputs, whereas off-farm support refers to farm roads, irrigation systems and market infrastructure, amongst others. For both policy scenarios, the simulation period is 15 years (2022 to 2037), even though the redistribution target is assumed to be reached in the next ten years – by the year 2032. The rationale for prolonging the model simulation to 15 years is to measure how the economy will adjust under both policy scenarios and identify winners and losers in terms of industries relative to the implementation of the land reform program in the country.

Another assumption we make in the model simulation is that newly settled farmers under different subsectors (i.e., field crops, livestock, and horticulture) will reach commercial and sustainability levels (time to reach productivity parity similar to that of established farmers) in different periods due to structural difference amongst these subsectors. We further assume that as the state strives to settle the outstanding land reform target, it will not consider the available land (underutilised or unused) in the former homelands because this is already under black ownership, that is, the traditional councils. However, it will target approximately 2.7 million hectares of unused agricultural land and currently used land with either low or medium land potential.

From Table 2, we deduce that 68% of total agricultural land is classified as low to medium land potential, suitable for animal or mixed farm production (i.e., animals and crops). Therefore, government will likely focus on the 55.9 million hectares to settle the outstanding land reform target. This assumption is informed by the current trends in the land reform programme, where out of the 9 million hectares transferred from 1994 and to date, about 31% was purchased in the Northern Cape, 12% in the North West, and 8% in the Free State provinces. According to the land capability assessment conducted by the ARC (2019), these provinces have low to medium land potential. It is assumed that established farmers will first sell unused land, and thereafter sell low to medium-potential land to government for land reform purposes. This assumption is made under the caveat that the selling farmer has a sustainable and profitable farming business and is unlikely to sell his/her high-potential land.

For both commercial or former homeland areas, the structure of the agricultural sector is assumed to be the same, where livestock production (animal grazing) accounts for 68% of land utilisation, crops use

14% of good to high potential land, and about 5% is dominated by fruit and vegetable production under irrigation. In contrast, the remainder of the land portion is considered unsuitable for production due to soil erosion, soil contamination, steep slope, and other factors. Moreover, informed by the literature, we assume that the productivity gap in the field crops between newly settled farmers versus established farmers is 67% measured in tons per hectare. This means a new farmer can only attain 33% yields relative to what an established farmer can achieve on the same land. In the livestock subsector, the productivity gap is 45%, measured as a calving rate, implying that new farmers can achieve a 55% calving rate relative to established farmers. In the horticultural sub-sector, the productivity gap is 35%, measured in tons per hectare, meaning new farmers are able to attain 65% of the yields of established farmers. As stated earlier, productivity gaps are informed by information collected from commodity groups (i.e., Grain SA, RPO, Potato SA) and compared with studies by Liebenberg (2013), Nengovhela (2021), and Nkadimeng *et al*. (2022). Lastly, we assume that the cost to support new producers will increase by an average annual inflation rate of 6% for all subsectors (even though individual years may exceed or be lower than this average). This study does not explicitly account for monitoring and evaluation costs in these estimations, given the uncertainties associated with such an exercise; however, this is crucial in achieving the success of transformation projects.

The study departs from the view that land reform is necessary to correct historical injustice, and that government must continue with the programme following market-friendly approaches. The study further notes that while land reform is a necessary intervention, it is a costly exercise, and government must allocate sufficient resources to ensure the programme is implemented successfully with minimal agricultural disruptions. The study holds *a priori* expectation that if land reform is implemented effectively (i.e., transfer land to deserving beneficiaries with transitional farmer support) following market approaches like the “willing buyer, willing seller”, it could positively impact the economy in the long term.

Table 6: Simulation design assumptions

Label	Items	Unit measure	Data source	Aggregate figure	Annual allocation									
					2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
A	Total Agriculture Land	Mill ha	DALRRD Abstract	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2	82.2
Land available for purchase to fulfil land reform programme target														
B	Not actively managed land	Mill ha	Own Calculations	2.7	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
B1	*Livestock*	Mill ha	DALRRD Abstract	1.83	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
B2	*Field crops*	Mill ha	DALRRD Abstract	0.37	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
B3	*Horticulture*	Mill ha	DALRRD Abstract	0.14	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
B4	*Not usable*	Mill ha	DALRRD Abstract	0.36	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
C	Low to medium potential land	Mill ha	Own Calculations	55.90	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59
C1	*Livestock*	Mill ha	DALRRD Abstract	37.84	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
C2	*Field crops*	Mill ha	DALRRD Abstract	7.71	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
C3	*Horticulture*	Mill ha	DALRRD Abstract	2.79	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
C4	*Not usable*	Mill ha	DALRRD Abstract	7.55	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Land to be transferred to attain 30% target (Official Government Estimate by DALRRD, 2022)														
D	Land to attain 30% target	Mill ha	DALRRD, 2022	15	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
D1	*Livestock*	Mill ha	DALRRD Abstract	10.05	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
D2	*Field crops*	Mill ha	DALRRD Abstract	2.07	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
D3	*Horticulture*	Mill ha	DALRRD Abstract	0.75	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
D4	*Not usable*	Mill ha	DALRRD Abstract	2.13	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Underutilised or idle land available for production in former homelands/ tribal areas based on estimates by Liebenberg (2013)														
E	Unused Agri-land in Former-Homelands	Mill ha	Liebenberg, 2013	4.3	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
E1	*Livestock*	Mill ha	DALRRD Abstract	2.9	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
E2	*Field crops*	Mill ha	DALRRD Abstract	0.6	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
E3	*Horticulture*	Mill ha	DALRRD Abstract	0.2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
E4	*Not usable*	Mill ha	DALRRD Abstract	0.6	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06

Label	Items	Unit measure	Data source	Aggregate figure	Annual allocation									
					2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Productivity gap between new and established farmers														
F	Weighted Productivity Gap	%	Own Calculations	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%	48%
F1	*Livestock*	%	Nengovhela, 2021 and Nkadimeng *et al.* 2022	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
F2	*Field crops*	%	Liebenberg, 2013 and BFAP, 2022	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%	67%
F3	*Horticulture*	%	BFAP 2022 and NAMC 2022	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%

Scenario 1: Land and agrarian reform without comprehensive farmer support

Informed by the above study assumptions, six policy shocks enter the model through two variables. The first variable is the productivity of primary factors (*a1prim*) to estimate the cost of changes in land utilisation from established to newly settled farmers. The second variable is the effective stock of land (*x1lnd*) to simulate the introduction of new land into production from underutilised former homeland areas and land previously unused by established farmers. Shocks are applied to both variables for field crops, horticulture and livestock industries to yield a total of 6 shocks that run simultaneously in the model.

Table: 7: Policy shock design for scenario 1

Item	Formula	Annual allocation									
		2022	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
New land added	E+D; D=B+C*0.22	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93	1.93
Livestock	*E1+D1; D1=B1+C1*0.22*	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Field crops	*E2+D2; D2=B2+C2*0.22*	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Horticulture	*E3+D3; D3=B3+C3*0.22*	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Not usable		0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Share of land added as the total of land under each subsector											
New land added		0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
Livestock		0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Field crops		0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
Horticulture		0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Adjustment factors: Share productivity loss											
Livestock		0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Field crops		0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
Horticulture		0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Policy shock: *x1lnd* – land transferred and brought into production											
Livestock		0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099
Field crops		0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154
Horticulture		0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294
Policy shock: *a1prim* – productivity loss											
Livestock		0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059
Field crops		0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
Horticulture		0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103	0.0103

To estimate the actual shocks, we use the data presented in Table 5 and Table 6. Table 5 shows the total number of hectares available to each subsector in the model. Then from Table 6, we obtain the calculated new land to be added. The actual formulae used to obtain new land from Table 6 are outlined in the top part of Table 7. Since the additional land in the model is now known, and the productivity gaps have already been reported in Table 6 (rows F1 to F3), we then assume that the newly added land will not be operating at full productivity level, as the new farmers lack or have limited farming skills,

have poor access to credit markets and are not receiving adequate support from the state. These factors are controlled for by means of the adjustment factors shown in the middle part of Table 7. We then calculate the actual size of the policy shocks (i.e., *a1prim and xlnd*) for all three subsectors (i.e., field crops, horticulture, and livestock). The actual sizes of the policy shocks under policy scenario 1 are reported in the bottom part of Table 7.

Scenario 2: Land and agrarian reform with comprehensive farmer support

The main difference between the first and second policy scenarios is the provision of farmer support to newly settled farmers on land reform farms. As such, the land shocks for all three subsectors (i.e., field crops, horticulture, livestock) are the same as in policy scenario one. However, since a farmer under each subsector reaches productivity parity at different times underpinned by the initial productivity gap (i.e., before farm support is provided) and the structure of each subsector's value chain, the length of second shocks (*a1prim*) varies across the three subsectors, which makes it more complex to incorporate in the model. We overcome this complexity by first calculating the time it will take for a typical farmer in each subsector to reach productivity parity relative to an established farmer in the same subsector. These are then reported in the upper part of Table 8.

Table 8: Policy shock design for scenario two

Item	Annual allocation									
	2022	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Number of years to parity: Achieving productivity between new and established farmers										
Livestock	55%	62%	69%	77%	87%	100%				
Field crops	33%	37%	41%	46%	52%	58%	65%	73%	82%	92%
Horticulture	65%	71%	77%	84%	92%	100%				
Farmer transitional support provided per hectare to reach parity: R'000										
Livestock	11.00	11.66	12.36	13.10	13.89	14.72	-	-	-	-
Field crops	152.00	161.12	170.79	181.03	191.90	203.41	215.61	228.55	242.26	256.80
Horticulture	590.00	625.40	662.92	702.70	744.86	789.55	-	-	-	-
Total farmer support: R million										
Livestock	11.17	11.84	12.55	13.30	14.10	14.95	15.85	16.80	17.80	18.87
Field crops	31.46	33.35	35.35	37.47	39.72	42.11	44.63	47.31	50.15	53.16
Horticulture	44.25	46.91	49.72	52.70	55.86	59.22	62.77	66.54	70.53	74.76
Land (*x1lnd*) shock										
Livestock	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099
Field crops	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154
Horticulture	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294	0.0294
Total Factor Productivity (*a1prim*) shock										
Livestock	0.0059	0.0055	0.0051	0.0047	0.0042	0.0037				
Field crops	0.0045	0.0043	0.0041	0.0039	0.0037	0.0034	0.0032	0.0030	0.0027	0.0024
Horticulture	0.0103	0.0097	0.0091	0.0085	0.0078					

Subsequently, we estimate the magnitude of farmer support required to reach productivity parity, which is reported in the middle part of Table 7. These are largely influenced by BFAP (2022), which report estimates that a typical farmer would need an average of R152 000 to establish and operate one hectare of grain or oilseed products. This figure goes up to an average of R590 000 per hectare for fruit and vegetables and drops to R11 000 per hectare for the animal industries. To obtain the total farm support, we multiply the total cost per hectare by the total number of new hectares added in the model, with the results reported in the middle part of Table 8. Thereafter, the actual size and period of both shocks (i.e., *a1prim* and *xlnd*) are calculated and reported in the bottom part of Table 8.

5 SIMULATION RESULTS AND INTERPRETATIONS

5.1 Estimated costs of land reform to attain the 30% transfer target

The study was initiated to estimate the costs of implementing an effective and successful land reform programme in South Africa. Moreover, the study quantifies the long-term effects of implementing the land reform programme and identifies the industries that will likely win or lose over time under both scenarios of land redistribution, with and without further government support. To achieve a successful land reform programme, there are two costs involved. First is the cost to purchase land to be transferred to new farmers. Secondly is the cost to support the newly settled farmers, to maintain and improve land productivity on par with the land of established farmers supported by the previous government regime before 1994. On the first cost, DALRRD had estimated that it would require approximately R11 billion per annum (roughly 0.2% of GDP) to transfer an average of 1.5 million hectares per annum over the next ten years. In this study, we adjusted these figures for inflation, and it rises to R18.6 billion by 2032, meaning the government will need to set aside R144.9 billion to purchase land in the next decade. This is the actual cost to achieve the 30% target.

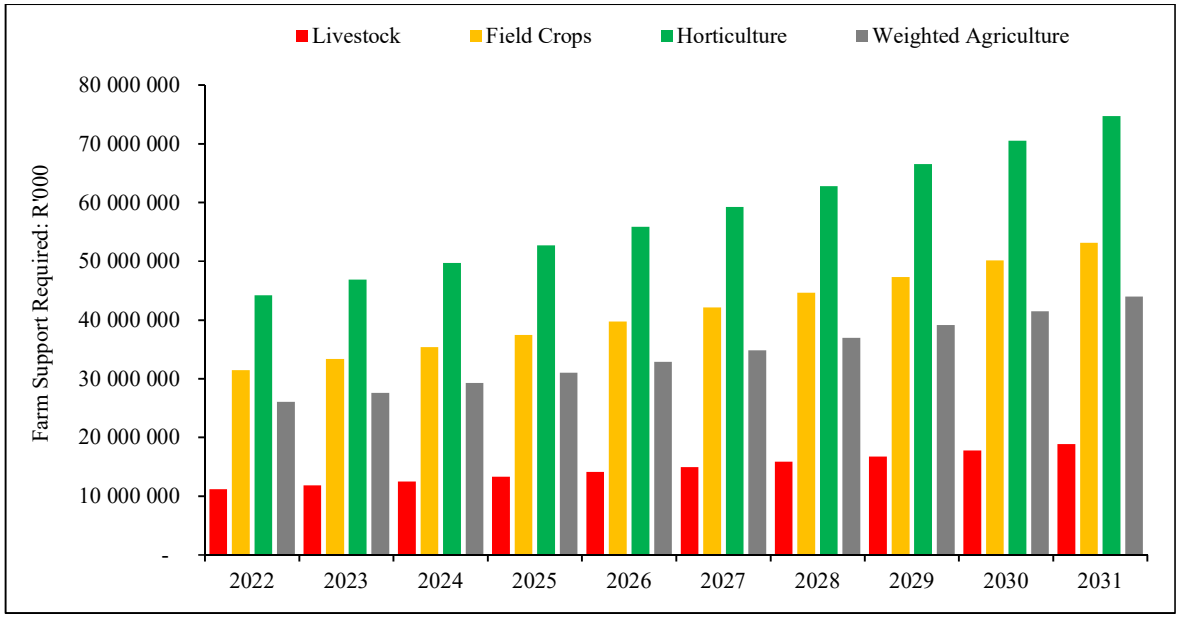
Additionally, to land purchase cost, is the transitional farmer support to help new farmers acquire the necessary skills, resources, equipment, and knowledge to close the productivity gap relative to established farmers. The total farmer support costs per subsector based on production costs estimated by BFAP (2022) are presented in Figure 2. The BAFP (2022) estimated average production cost per hectare for each subsector is outlined in Table 9.

Table 9: Transitional farmer support required to maintain land productivity post-settlement, including those operating in the former homelands (nominal rands)

Sub-sectors	Unit measure	References	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Weighted production costs	R'000	Own calculations	215.6	228.5	242.2	256.8	272.2	288.5	305.8	324.1	343.6	364.2
Livestock	R'000	BFAP, 2022	11.0	11.7	12.4	13.1	13.9	14.7	15.6	16.5	17.5	18.6
Field crops	R'000	BFAP, 2022	152.0	161.1	170.8	181.0	191.9	203.4	215.6	228.6	242.3	256.8
Horticulture	R'000	BFAP, 2022	590.0	625.4	662.9	702.7	744.9	789.6	836.9	887.1	940.4	996.8

For the weighted agriculture, the state will need to allocate R34 billion per annum for the next ten years to support new farmers to gain the necessary skills, access to markets and build the necessary infrastructure on land-reform farms and farms in former-homeland areas. Disaggregating the farmer support into the three subsectors, it is evident that support for horticulture is relatively high per hectare. However, horticulture uses a small number of hectares, but it is capital intensive due to the high cost of irrigation, plant material and needs to comply with international market standards, as the bulk (more than 65%) of horticulture products are exported to Europe, Asia and American markets. Livestock has relatively low farmer support requirements – mainly the cost to purchase high-quality animal breeds, construction of fencing to protect grazing lands, and feeding costs during winter periods.

Figure 2: Estimated support cost to close the productivity gap between new and established farmers

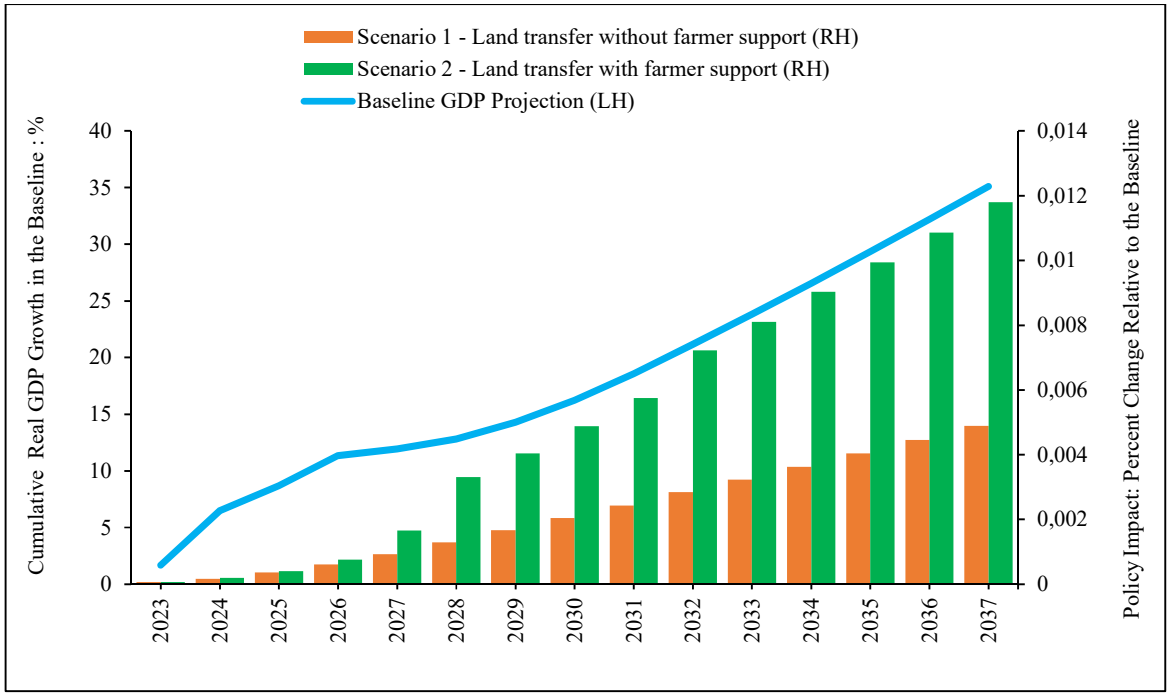


5.2 Land reform impact on South Africa's real economy

The first macroeconomic results present the measured impact of land reform policy implementation on the real GDP under the two policy scenarios, that is, land redistribution with and without transitional farmer support. Across the two designed policy scenarios, the effects of land reform are marginal but positive at the aggregate economic level. These results are the opposite of populist anecdotal assessments reported in the South African media and some lobby groups' publications. The cumulative effect of land reform on real GDP is 0.004% above the baseline by 2037 under policy **scenario 1** and is 0.01% above the baseline under policy **scenario 2** (see Figure 3). The positive results are caused by new land being made available to produce food in both commercial agriculture and former homeland areas. Although the productivity of land transferred to new farmers is lower, its overall economic impact is offset in **scenario 2** by allocating the necessary farmer support. As a result, the deviation in GDP relative to the baseline is minimal under **scenario 2** as compared to **scenario 1.** In the baseline scenario, GDP is projected to grow by 35% by 2037 relative to 2021. In the third quarter of 2022, Statistics South Africa estimated the size of real GDP at R4.5 trillion (constant 2015 prices), implying that the real GDP size in our study baseline will be equivalent to R6.08 trillion in 2037. This means that the impact of implementing the land reform effectively under scenario one could potentially add R243.4 million above the baseline in the long term because the new land productivity will remain constrained without farmer support. However, under scenario 2, which assumes the new land will be transferred to new farmers with the associated farmer support to reduce the productivity gap between new and established farmers, this could potentially add R608.6 million above the baseline in the long term. It should be noted that various potential spillover shocks related to the fallout of an unsupported land reform programme under scenario 1 were not considered.

First, the results indicate that a land reform programme aligned to effective and adequate farmer support can potentially increase a policy gain (positive contributions to society) by 40% compared to a land reform with no farmer support. This is consistent with the current trends in agriculture, where government has transferred more than 9 million hectares of land to farmers since 1994 but without required farmer support. As a result, the contribution of new black farmers to overall agricultural output remains negligible, as estimated at less than 10% by the NAMC in 2021. Many scholars, including Sihlobo and Kirsten (2021), ARC (2019), Liebenberg (2013) and others, cite the lack of transitional farmer support as one of the major factors limiting the success of newly settled farmers.

Figure 3: Policy impact on real economic (GDP) growth relative to the baseline



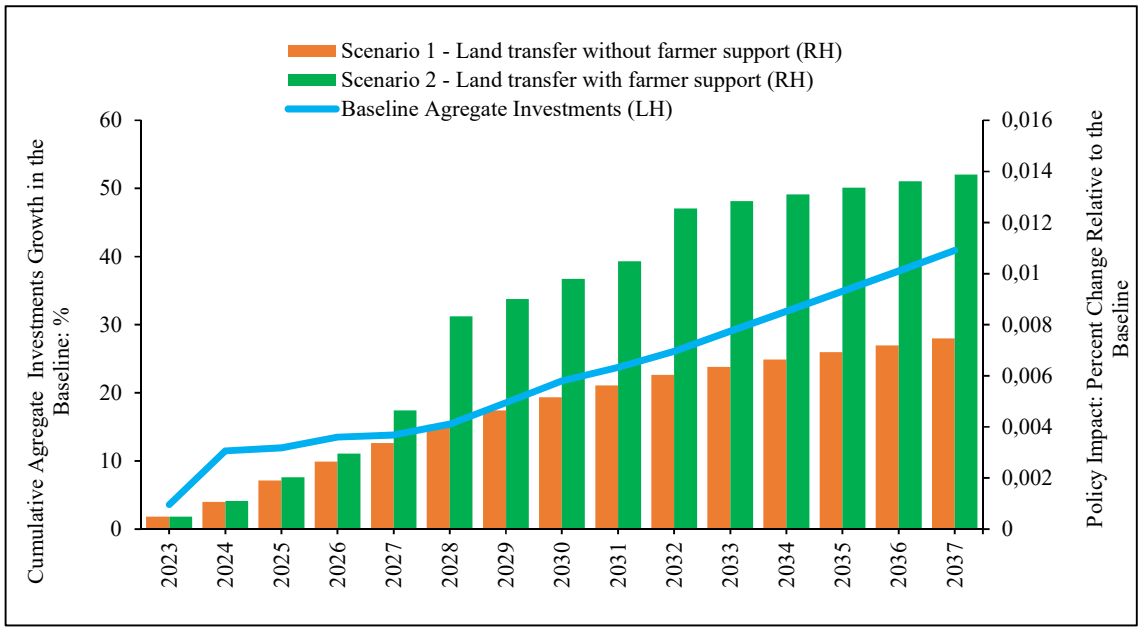
Second, the policy shocks on the productivity of the transferred land acknowledge that there is a gap between new and established farmers; however, it does not assume that transferred land will be completely unproductive, an assumption often made by researchers exploring the land question in South Africa. The policy shocks also consider the new land, which is the land that was either unused or considered low potential by established farmers. Additionally, the policy design acknowledges new, though minimal, land being brought to production by previously disadvantaged farmers in the former homeland areas. As a result, the model reads such intervention positively, with spillover effects from the primary industry to secondary industries like food manufacturing, trade and hospitality, which rely on agriculture for raw materials. However, the positive effect is marginal because of large productivity gaps between new and established farmers. Effectively, the results imply that while the land reform programme could cost government large sums of money and the agricultural industries could see stagnant and negative growth in the short to medium term, the long-term effect will be positive on the overall economy (see Figure 3), provided the land reform programme is implemented using market-friendly approaches, complemented by transitional farmer support to maintain and enhance land productivity.

5.3 Land reform impact on South Africa's total investment

Like other macroeconomic indicators such as aggregate private consumption, and net trade, the investments also appear to be positively impacted by the designed policy shocks. Figure 4 shows that

land reform policy implementation in line with designed policy shocks will improve aggregate investment by 0.00746% under **scenario 1** and by 0.01388% above the baseline under **scenario 2** in the long term. This implies that overall investment in the economy will be positive in the long term as more farmers contribute meaningfully to the agricultural economy, thereby attracting investments. The positive investments also imply that related industries like food manufacturing, trade, hospitality and others will benefit as they are closely related to primary agricultural industries.

Figure 4: Policy impact on aggregate investments relative to the baseline



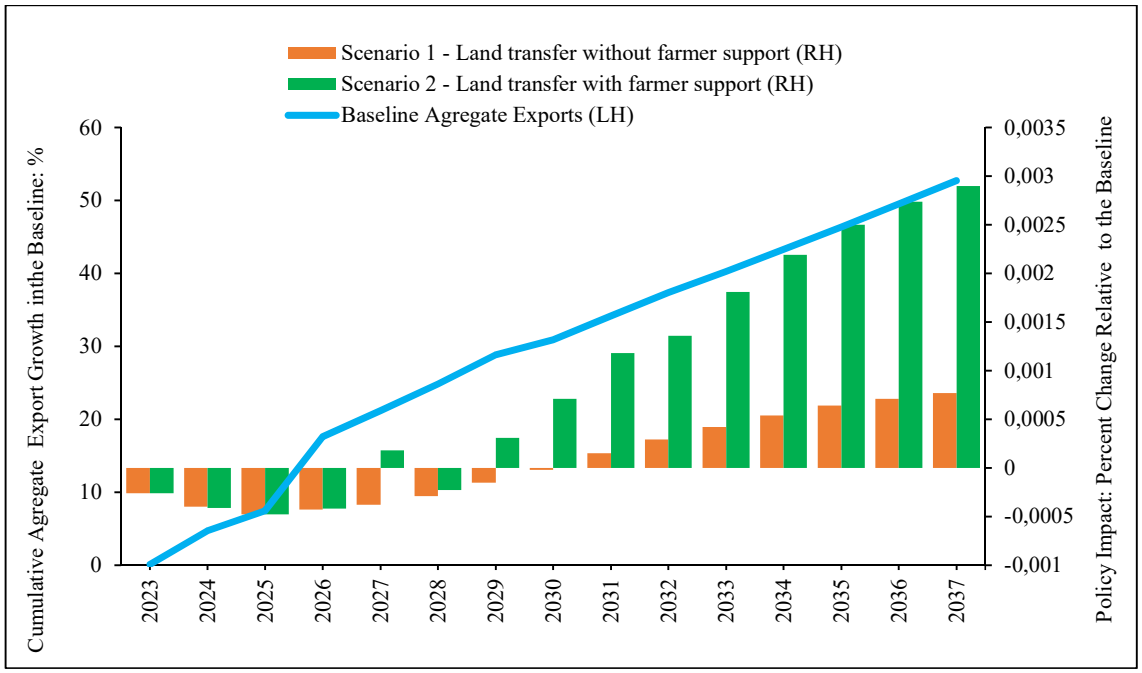
5.4 Land reform impact on South Africa's total exports

Figure 5 presents the impact of the two designed policy scenarios on aggregate exports. The long-term impact is positive under both scenarios, implying the policy changes are good in the long term for the country and consistent with the real GDP results discussed above. Importantly to note is that in the short to medium term, the policy implementation will negatively impact aggregate exports. In the database used to simulate the policy impacts, the agricultural sector, comprising field crops, horticulture, and livestock, contribute about 10% to total exports, meaning they play a crucial role in generating foreign earnings for the country. As a result of this relatively big contribution to exports in the baseline, the short to medium-term implications are negative, although small in magnitude.

The negative short-to-medium-term impact is caused by adjustment factors in the model, where production and, subsequently, the exportable products are affected as new farmers are unable to produce or maintain the same productivity level as established farmers. The model results then show that over time, as new farmers gain the necessary skills and experience, they are able to improve productivity and

produce sufficient quantities for exports. With farmer support, the recovery rate of new farmers is higher as exports turn positive in the fifth year compared to the **scenario 1** case, where aggregate exports only register a positive gain in year nine.

Figure 5: Policy impact on aggregate exports relative to the baseline

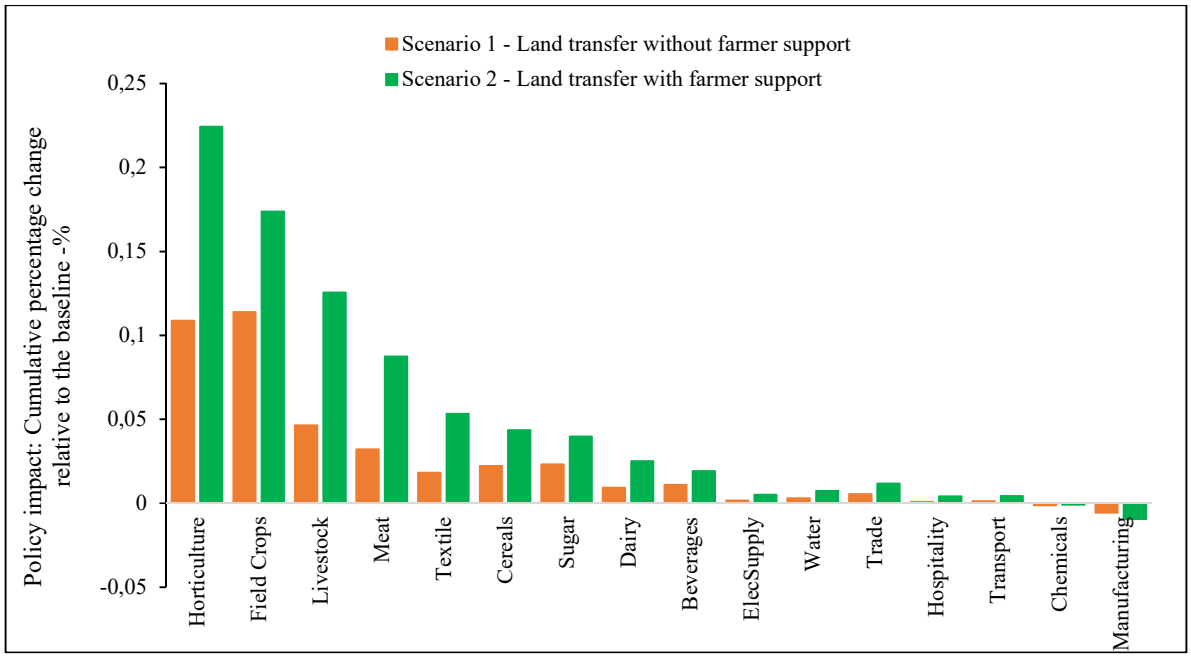


5.5 Land reform impact on South African industries (winners and losers)

5.5.1 Winners and losers on industry outputs

The baseline on industry output is simulated in line with the BFAP projections depicting the business as usual (BaU). Field crops are expected to grow by up to 14.73%, cumulative in 2037, attributed to the investment in technology, better-yielding cultivars and mechanisation. Horticulture is expected to grow by 23.81% due to investment in infrastructure such as dams and irrigation systems, leading to more water availability. More water availability and accessibility will eventually result in more output. Export market opportunities are anticipated, thus creating more demand for horticultural products, especially fruits. For livestock, the model depicts a relatively weaker growth of 11.15% due to challenges around biosecurity measures such as the outbreak of bird flu (i.e., Avian Influenza), foot and mouth disease on cattle, goats and sheep and the African swine fever in pigs, amongst others.

Figure 6: Long term policy impact on selected industries' output



The results show that most industries' output is negative in the short run, accounting for the land adjustment factor due to the productivity gap between commercial and newly settled farmers. However, in the long run, the impact of land redistribution is positive as newly settled farmers gain the necessary skills for output production and market access. It is envisaged that, with farmer support provided, the recovery in terms of output is much stronger in **scenario 2,** reaching 0.174%, 0.224 % and 0.126% for field crops, horticulture and livestock, respectively. The manufacturing industry is expected to experience an output decline relative to the baseline in the long run when the land redistribution policy is implemented, recording a decline of 0.0055% and 0.0095% for **scenario 1** and **scenario 2**, respectively. The chemical industry is also among the industry losers due to high prices, resulting in unaffordability by newly settled farmers.

5.5.2 Winners and losers of industry employment

The agriculture sector plays a major role in the country's rural development, especially in the employment creation agenda. It is more labour-intensive and absorbs lower to semi-skilled workers. These additional jobs, even though admittedly low, are brought about by new land brought into production as well as spillover effects on downstream industries like food and beverages. Figure 7 depicts the expected effects of sectoral employment, increasing above the baseline by 0.0039% in scenario 1 and 0.0076% in scenario 2.

Figure 7: Long-term policy impact on selected industries' employment

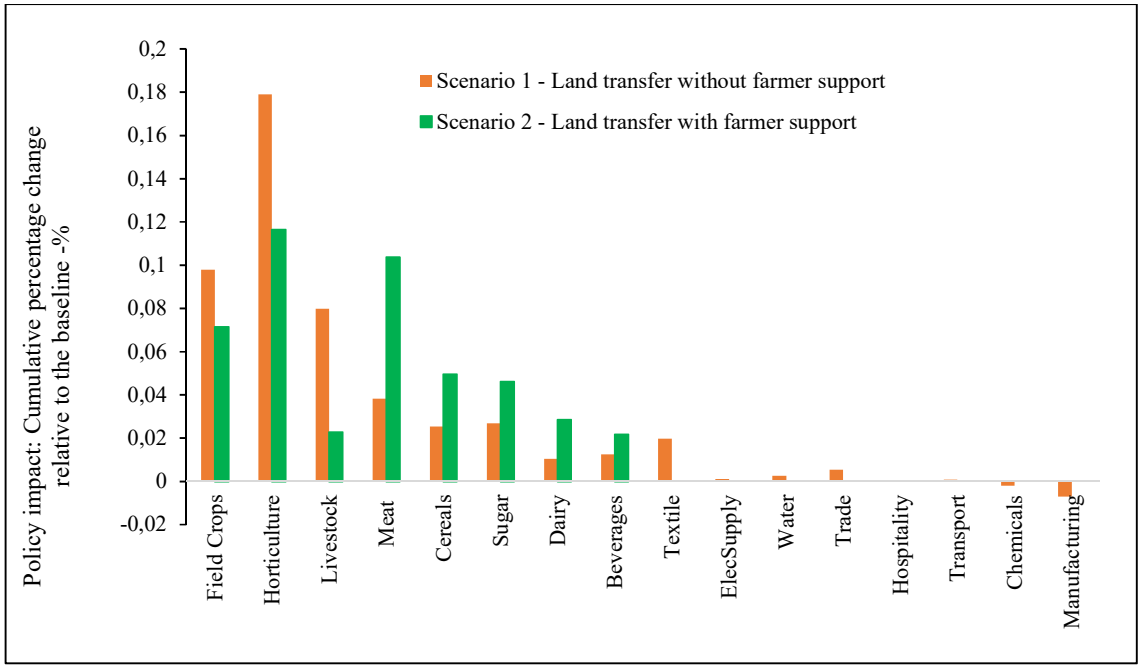


Figure 7 illustrates that in **scenario 1**, horticulture created 55% and 45% more employment than field crops and livestock, respectively. The increase in employment relative to baseline is attributed to the manual labour required to manage the minimum standards and quality assurance in handling the produce – especially fruits for the export market. Although employment is impacted by mechanisation and new technologies in the field crop industry, positive growth is recorded due to the land brought into production. Livestock does not require more workers due to the nature of the business, which is mainly grazing.

More employment is created under **scenario 2** than under **scenario 1** as a result of the support provided for newly settled farmers. Horticulture is expected to create 61% and 20% more employment than field crops and livestock, respectively. The productivity of employed personnel is evident in **scenario 2,** attributed to their capacitation based on required skills. This is important in addressing the challenges of inclusive growth to enhance social cohesion. Conversely, manufacturing and chemicals are expected to lose employment in the short and long run as workers migrate to agriculture industries.

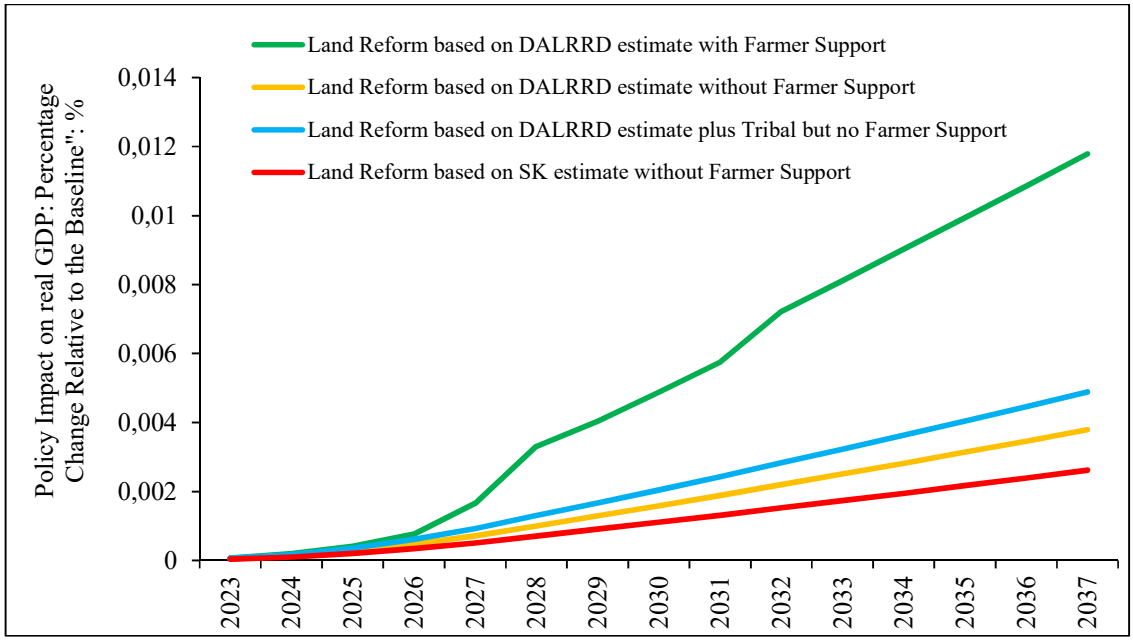
5.6 Sensitivity analysis of different land policy scenarios

Earlier in the paper (in section 2.1), we report that there are different estimates regarding the amount of land transferred to black people under the land reform programme. We reported that the official estimate by DALRRD (2022) is that 10% of agricultural land has been transferred to date, whereas Sihlobo and

Kirsten (2021) argue that approximately 17% of land has been transferred if you also account for cash-settlement and private land acquisition. Furthermore, we noted in the literature that scholars such as Liebenberg (2013), Cousins (2016), and Kepe and Hall (2018) argue that land reform and agricultural development should also take cognisance of available land in the former homelands areas to achieve an inclusive growth outcome in the country.

To assess these propositions against our own policy scenarios discussed in section 5, we formulate two more policy scenarios in addition to those discussed earlier. **Scenario 3** posits the amount of land to be transferred based on the official estimates by DALRRD; however, it excludes the available agricultural land in the former homeland areas. **Scenario 4** simulates the amount of land to be transferred based on the estimates by Sihlobo and Kirsten (2021). Figure 8 presents the results of all four policy scenarios as percentage changes relative to the cumulative real GDP baseline. Common across all policy scenarios is that the programme could positively impact the economy if implemented effectively, following market-friendly approaches.

Figure 8: Sensitivity analysis of various land reform policy approaches relative to the baseline



Note: *SK = Sihlobo and Kirsten; DALRRD = Department of Agriculture, Land Reform, and Rural Development.*

Starting with the policy scenario simulating the land transfer figures estimated by Sihlobo and Kirsten (2021), this results in the least impact on the GDP in the long term. This is because Sihlobo and Kirsten (2021) argue that the land transferred under the land reform programme is much closer to the initial 30% target, and fewer hectares of land still need to be transferred to black farmers than previously

reported. As a result, the scenario simulating the Sihlobo and Kirsten estimates implies less land will be transferred in the future, therefore, minimal deviation from the baseline in the long term. Policy scenarios based on DALRRD estimates show a slightly higher impact on the real GDP in the long term simply because relatively large quantities of land are transferred to black farmers over the next decade. These translate to more production and investments beyond the current commercial agricultural areas.

Perhaps the most important observation from the sensitivity analysis is the importance and impact of transferring land together with the required transitional farmer support. Whether one follows the estimates by DALRRD (2022) or Sihlobo and Kirsten (2021), both have a limited impact compared to the policy scenario where farmer support is provided. Importantly, these results imply that the land question should focus more on the type and magnitude of farmer support required to ensure the transferred land is productive and sustainable. This area tends to be overlooked by policymakers as they focus on accelerating land transfer but pay little attention to ensuring adequate and proper farmer support.

5.7 CONCLUSION

In the analysis discussed in this chapter, a dynamic CGE model is used to quantify the economic effects of land redistribution on the South African economy, explicitly taking into account the productivity gap of transferred land to previously disadvantaged farmers alongside the identified transitional support required. The long-term benefits of implementing a comprehensive land reform programme to address land inequality and promote equitable participation in the agricultural economy become evident from model results. The simulation output suggests that achieving the land reform target will benefit GDP by R242.4 million under scenario 1 and R608.6 million under scenario 2. In the case of scenario 1, ignoring possible negative spillover effects means the result is probably over-optimistic, with the gains mainly stemming from the increase in productive land, not the transfer programme itself. Similarly, scenario 2 probably underestimates the positive effects of a well-managed reform programme, as positive spillover effects that may further boost investment are not considered.

Under the assumptions discussed, the macroeconomic results show that the impact of land reform policy changes under the two scenarios (without farmer support and with farmer support) are expected to be positive but minimal at the aggregated economic level. The results further show that the land redistribution aligned with comprehensive farmer support (**scenario 2**) can potentially increase the policy gains compared to **scenario 1**.

The sectoral results show that land reform policy will have a positive impact on the majority of industries in the long run. The economic benefit includes more jobs created in the agricultural sector and associated industries like food manufacturing as well as improved industry output. Horticulture is expected to create more employment than field crops and livestock due to the manual labour required

to manage the minimum standards and quality assurance in handling the produce, especially in line with the export market requirements.

The sensitivity analysis suggests that the land reform programme could positively impact the economy across all four policy scenarios if implemented effectively, following market-friendly approaches. The sensitivity analysis indicated the importance of transferring land together with the required transitional farmer support. However, the focus should be more on the type and magnitude of farmer support required to ensure the land tendered is kept productive. The overall results show that the agriculture and food industries will benefit when the land reform policy is implemented effectively. These benefits will translate to more persons playing a participating role in the formal agricultural economy, thus correcting the injustices caused by historical laws of excluding black persons from the formal agricultural economy. An important message supported by this research is that land redistribution will not harm the economy if implemented using market-friendly approaches accompanied by comprehensive farmer support. Although the implementation of land reform might be a costly exercise initially, it can be achieved with lesser costs than what is assumed or expected. Land reform is, first and foremost, a social justice project, hence the importance of government and the private sector working together in creating a just and inclusive agricultural landscape. The fact that this programme can also boost economic growth in the long run, is a welcome bonus.

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Appendix A: Mapping of industry and commodity sets in the expanded database

Table A.1: CES Armington elasticities for Agriculture and its sub-sectors.

Commodity	Armington Elasticity	
	Short-run	**Long-run**
Agriculture	0.329***	0.376
	-0.038	-0.172
Horticulture	0.406**	0.57**
	0.141	0.138
Livestock	0.62*	0.83**
	0.468	0.169
Field crop	1.16**	1.85*
	0.305	0.133

*** p<0.01, ** p<0.05, * p<0.1

Source: *CGE model output*

Table A.2: Macroeconomic and Technology changes forecast data used to calibrate the baseline scenario

Variables	Source	Actuals				Short to medium-term Estimates				Long-term estimates			
		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029 - 2037
Real GDP (%)	NT, 2023	1.5	0.3	-6.3	4.9	2.5	0.9	1.5	1.8	1.8	1.8	1.8	1.8
Household (%)	NT, 2023	2.4	1.2	-5.9	5.6	2.8	1.0	1.5	1.8	1.8	1.8	1.8	1.8
Government (%)	NT, 2023	1.0	2.1	0.8	0.6	0.3	-2.2	0.4	0.0	0.0	0.0	0.0	0.0
Investment (%)	NT, 2023	-1.8	-2.1	-14.6	0.2	4.2	1.3	3.8	3.5	3.5	3.5	3.5	3.5
Export (%)	NT, 2023	2.8	-3.4	-11.9	10.0	8.8	1.0	2.2	2.9	2.9	2.9	2.9	2.9
Imports (%)	NT, 2023	3.2	0.4	-17.4	9.5	14.0	1.1	2.3	2.9	2.9	2.9	2.9	2.9
Inflation (%)	NT, 2023	4.6	4.1	3.3	4.5	6.9	5.3	4.9	4.7	4.8	4.9	4.10	4.11
Interest rates (%)	SARB, 2022	6.6	6.7	4.3	3.5	5.2	7.1	5.4	5.1	5.1	5.1	5.1	5.1
Current Account Balance (%)	NT, 2023	-3.0	-2.6	2.0	3.7	-0.4	-1.8	-2.0	-2.1	-2.1	-2.1	-2.1	-2.1
Population (%)	The World Bank, 2022	1.2	1.3	1.2	1.0	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1
Unemployment (%)	Stats SA 2022	26.9	28.5	29.2	33.6	32.9	32.7	31.4	32.0	32.0	32.0	32.0	32.0
Exchange rate (R/$)	SARB, 2022	13.2	14.4	16.5	14.8	16.3	15.1	15.4	15.6	15.6	15.6	15.6	15.6

Sources: National Treasury, 2023; SARB, 2022; The World Bank, 2022; Stats SA, 2022.

Short and -medium-term estimates (2024 to 2025) for interest rates, population, unemployment and exchange rates were calculated by taking the average of the previous five years.

Table A.3: Industry sets mapped using Standard Industry Classification

INDUSTRY	Division SIC	Major SIC	Group SIC	Industry explanatory notes SIC 5th Edition of 1993
Field crops	11	111	1111 & 1160	Growing of cereals; other crops and organic fertilisers
Horticulture	11	111	1112 & 1113	Growing of vegetables; nursery; wine; fruits and nuts
Livestock	11	112	1121, 1122, 1130, 1151-2	Farming of cattle, sheep, goats, poultry, pigs, game and others
Forestry	12		1210 & 1220	Forestry; logging and related services
Fisheries	13	131-132	1310-1320	Fish and aquatic animals; hunting and commercial fish farming
Meat	30	301	3011-3012	Processing and preservation of beef; sheep; poultry and fish meat
Cereals	30	301-304	3013-3049	Processing and preserving of fruits and vegetables, grains, animal feed, food oils and fats as well as other foodstuffs
Sugar	30	304	3042 & 3043	Manufacturing of sugar and sugar confectionery
Dairy	30	302	3020	Manufacturing of dairy products
Tobacco and beverages	30	305-306	3051-3060	Manufacturing of wine, spirits, beer, soft drinks, mineral water and tobacco products
Textiles and footwear	31	311-317	3111-3170	Manufacturing of textiles; clothing and leather goods
Wood and paper	32	321-326	3210-3260	Manufacturing of wood products; paper and published printing
Coal lignite	21			Coal and lignite mining products
Crude gas	22			Crude gas
Electric gas	22			Natural gas
Other mining	23-29			Gold; uranium; metal ores; other mining, quarrying
Petroleum	33	331-332		Coke and refined petroleum
Chemicals	33	333-336		Chemicals and nuclear
Plastic and rubber	33	337-338		Plastic and rubber
Metal and steel	34-35	341-359		Glass; metals; steel and others
Manufacturing	36-39	361-395		Manufacturing of non-metallic; basic metals; furniture & equipment

INDUSTRY	Division SIC	Major SIC	Group SIC	Industry explanatory notes SIC 5th Edition of 1993
Coal and non-coal generation	41			Electricity generated from coal, wind, solar, nuclear, gas and hydro
Electricity supply	41			Distribution of electricity
Water	42	412	4120	Collection; purification; distribution of water
Construction	50	501-505	5010-5050	Site; building; civil; roads; railway and street construction
Trade	61, 62 & 63	611-633	6110-6350	Wholesale, retail trade and motor vehicles
Hospitality	64	641 & 642	6410 & 6420	Hotels and restaurants
Transport services	71- 74	711-741	7111-7419	Land; air; water transport and supporting activities
Telecommunications	75	751	751-7520	TV & radio equipment and post and telecommunications
Business services	81- 88	811-889	8111-8899	Financial; insurance; real estate and business services
Government	91- 94	911-940	9111-9400	Public services, including education; health; defence; and social services
Other services	95- 99, 01, 02, 03 & 09	951-990	9511-9909	Member organisations; private households; exterritorial organisations; foreign government representatives and other activities.