Proposing a farm assessment toolkit: evaluating a South African land reform case study

Aart-Jan Verschoor[a,*], Colleta Gandidzanwa[b], Terence Newby[c], Anneliza Collett[d] and Sonja Venter[e]

[a] Agricultural Research Council– Agrimetrics, Hatfield, Pretoria;

[b] Future Africa Institute, University of Pretoria, Hatfield, Pretoria;

[c] GeoTerraImage (Pty) Ltd. AgriHub Business Park, Willows, Pretoria;

[d] Department of Agriculture, Land Reform and Rural Development (DALRRD), Riviera, Pretoria; e Agricultural Research Council -Vegetables, Industrial and Medicinal Plants, Roodeplaat, Pretoria

*CONTACT Aart-Jan Verschoor. Agricultural Research Council– Agrimetrics, Hatfield, Pretoria. Email: aartjan@arc.agric.za

Abstract

The paper presents a robust, scientific evaluation method to determine the potential viability of a farm, compared to its current performance. The comparison informs recommendations for sustainable farm development. The process entails a stepwise analysis of land suitability, enterprise potential, infrastructure status, operator capacity, inherent limitations and external risks of the farm. An expert panel considers quantitative and qualitative data to establish suitable development measures. Applied to a land reform initiative, ±2000 farms entailing 1.86 million hectares were evaluated, detailing corrective measures for each farm. Roughly 59% of the evaluated farms were potentially commercial, but only 7% performed accordingly. Correlations between farmer capability and farm performance, as well as between infrastructure and performance, were evident, indicating that post-settlement support is vital. As risk and limitation scores increased, farm viability tended to decrease. The tool accurately determined viability based on available resources (natural and physical), resulting in evidence-based policy advice. The evaluation informed land reform policy recommendations, proposing more coordinated support to improve access to services. The tool would also be useful for farmers to reflect on enterprise performance. The visual, sequential nature of the evaluation facilitates sound decision-making. The tool has potential as a valid agricultural development evaluation instrument.

Keywords: Quantitative; qualitative; capability; viability; evaluation criteria

1. Introduction

Agricultural development facilitates economic growth (Liebenberg, Pardey, and Kahn 2010; Diao, McMillan, and Rodrik 2019). Evaluating agricultural developmental initiatives is therefore sensible. A review of monitoring and evaluation (M&E) in agricultural development projects found it crucial for improving efficiency, yields and farmers' income. The M&E process detects sound approaches, highlights areas that require improvement and enables stakeholders to adapt their approaches (Nor Diana et al. 2022). Hence, M&E has a key role in agricultural development, providing evidence-based insights and enhancing efficiency, sustainability and impact.

A review of M&E application, however, indicated poor execution. An expert assessment revealed that the ability to capture data was the weakest link in most M&E exercises (Lindstrom 2009; Muller-Praefcke et al. 2010). Addressing this challenge, Lindstrom (2009), Haddad, Lindstrom, and Pintoi (2010) and Schindler, Graef, and König (2015) indicated that a pragmatic, statistically robust tool, using quantitative and qualitative inputs, as well as including participant engagement, is required for optimal M&E. This is particularly relevant for public initiatives such as land reform.

According to the FAO (2010), land reform entails measures that improve land market functioning, productivity and rural development, correct inequities in land distribution, improve social justice, reduce poverty, address environmental issues, and provide security of tenure. The World Bank (2014) defines it as reform of ownership, operation or regulation of land to attain broader economic, political or social objectives. Lipton (2009) describes it as legislation intended to redistribute ownership of, claims on or rights to farmland, to benefit the poor by raising their status, power and/or income. In essence, land reform is a multifaceted process that involves redistribution of land ownership and tenure security.

Assessing land reform is vital to identify best practices and pitfalls. Success appeared to depend on effective implementation, access to resources and inclusive decision-making (Place 2009). In terms of productivity, mixed results are documented. While some research suggests that land reform can increase productivity among smallholders, challenges such as access to credit, infrastructure and market integration limited impact (Simtowe et al. 2013; Lowder, Skoet, and Raney 2016).

Land reform policies can affect productivity, employment and broader sustainable development. Land reform was found to foster sustainable land management in certain cases, as secure tenure encouraged investment in land improvements, natural resource conservation and diversification, whilst also creating employment opportunities (Jayne et al. 2021). Importantly, the United Nations already described sustainable development in 1978 as a holistic approach to societal progress that seeks to harmonise economic growth, social inclusion and environmental protection, ensuring that current needs are met without jeopardising future generations. This concept became a guiding principle in international policy and governance, highlighting the urgency of adopting practices that address environmental challenges and promote social equity (UN 2020).

In South Africa, land reform has been a priority since democratisation in 1994. It aims to address historical injustice, improve equity and promote agricultural development. Impact studies indicated disappointing results in achieving social justice and reducing land inequality, and its impact on productivity and food security was generally low. Studies specifically revealed institutional challenges. including bureaucratic delays and inadequate funding. Whilst some positive impacts in terms of livelihoods and income generation were recorded, sustainable land reform depends heavily on access to resources, training and supportive policies. Widespread institutional and post-settlement support bottlenecks were found (Binswanger-Mkhize 2014; Drimie 2016; LRAAP 2019; Sihlobo and Kirsten 2019; Vink and Kirsten 2019).

Poor beneficiary selection was identified as a major reason for dismal land reform results in South Africa. The presidential advisory body on land reform and agriculture (LRAAP 2019) also came to this conclusion and suggested a clear, transparent selection process. Another review, using a profile of 833 potential beneficiaries, suggested that age, training, capital, willingness to take risks, aspirations and most importantly entrepreneurial, financial and farming skills were critical in beneficiary selection (Binswanger-Mkhize 2014; Zantsi and Greyling 2021).

Local land reform initiatives generally lacked M&E, thus limiting feedback into policymaking (LRAAP 2019; Vink and Kirsten 2019). Developing an M&E tool to scientifically assess performance therefore addresses a key developmental shortcoming. Sound M&E should highlight failures, facilitating improved interventions in land reform initiatives.

Government introduced the Proactive Land Acquisition Strategy (PLAS) in 2006 to accelerate land redistribution, acquiring roughly 3 million ha of farmland by 2017. It spent approximately R8.5billion between 2009 and 2014, buying farms and allocating these to new users (Okunlola et al. 2016). Previous PLAS evaluations typically dealt with a selection of farms in a particular setting and are generally critical of its impact, also quoting beneficiary selection and post-settlement support limitations (Makombe 2018; Vink and Kirsten 2019; Maka and Aliber 2019; Mtero, Gumede, and Ramantsima 2023).

In contrast, this study considers all land purchased under PLAS up to 2019, constituting an extensive evaluation. The paper presents a scientific assessment tool, based on a (PLAS) farm's natural resource base, to establish its potential, in reference to current enterprises and farmer performance, determined through a survey. This resulted in farm reports with recommendations which, combined, constitutes a broad evaluation of land reform. The paper describes the stepwise process implemented to establish the value of the methodology in evaluating the performance and impact of land reform, the PLAS in particular.

2. Conceptual framework

Various procedures are used to assess agricultural development, simplifying the description of complex systems. As describing a multidimensional process is complex, making perfect evaluations uncommon (Cruz, Mena, and Rodríguez-Estévez 2018). Van Mil et al. (2014) suggested that "systems are part of the continuously changing, self-organising, interdependent and adaptive processes in our world". In the context of climate change and disruptive technologies, farms are subjected to external changes. Farm evaluations should therefore involve multi-scale and disciplinary interdependencies, as they vary in aspects such as scale, enterprise diversity and farm management capabilities. This requires expertise from various fields, making interdisciplinary efforts with capability in economics, engineering, mathematics and environmental approaches necessary to understand the farm system.

Accepting the complexity of the multidimensional process, this paper suggests an evaluation process. It firstly describes the value of M&E in agricultural development, the importance of M&E in land reform, and the limited success of land reform in South Africa. It then proposes an approach that is scientific and based on qualitative and quantitative data. The paper tests the approach with a PLAS case study, proving that the sequential methodology suggested is practical, efficient and accurate. It involves a multidisciplinary, iterative approach, considering various types of data. Figure 1 shows a simplified version of the complexity of the methodology proposed.

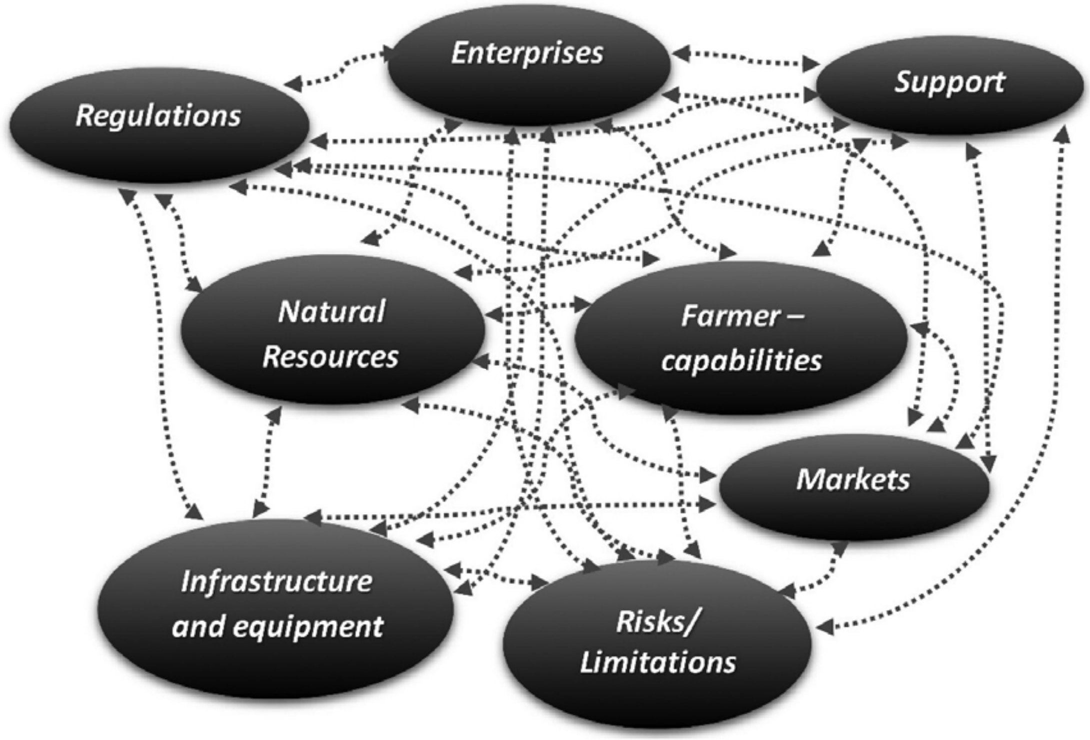

Figure 1. "Messy" representation of the complex farm assessment tool.

Source: Authors' own compilation.

Farm performance is most often assessed using quantitative metrics, such as yields and income. Integrating qualitative indices enables a more holistic assessment. The farm manager's role is pivotal and assessing their performance involves various criteria. In this analysis, farmers' skill levels were assessed based on productivity, decision-making ability, usage of support and technology as well as overall farm condition. The importance of qualitative aspects, relating to adaptability, innovation and management skill, provides insight into a farmer's ability to adapt and implement sustainable practices (Ahmed, Xiyun, and Shihong 2018). Hence farmers' performance was assessed, to identify shortcomings addressed through training or other support.

As managerial capacity, infrastructure and equipment constitute the foundation of efficient farming, qualitative indices to score these aspects were deemed vital, highlighting potential limitations and solutions (Khan et al. 2021). Qualitative indices to establish farm enterprise performance were therefore considered and valuable in establishing effective strategies for sustainable and improved performance. A challenge was appropriate weighting and scoring of these indices since bias can result in analysis of qualitative data that relies on human perception. This was countered by a participatory approach in which a group of experts was used to provide a balanced perspective that ensured robust scoring (Cruz, Mena, and Rodríguez-Estévez 2018; Chopin, Mubaya, and Descheemaeker 2021).

3. Methodology

The methodology combined primary and secondary sources, including qualitative and quantitative farm data from the ±2000 PLAS farms, obtained through a comprehensive farm survey of these farms, dispersed across South Africa (Figure 2). A team of enumerators from a private consultancy firm collected and quality-checked the survey data.

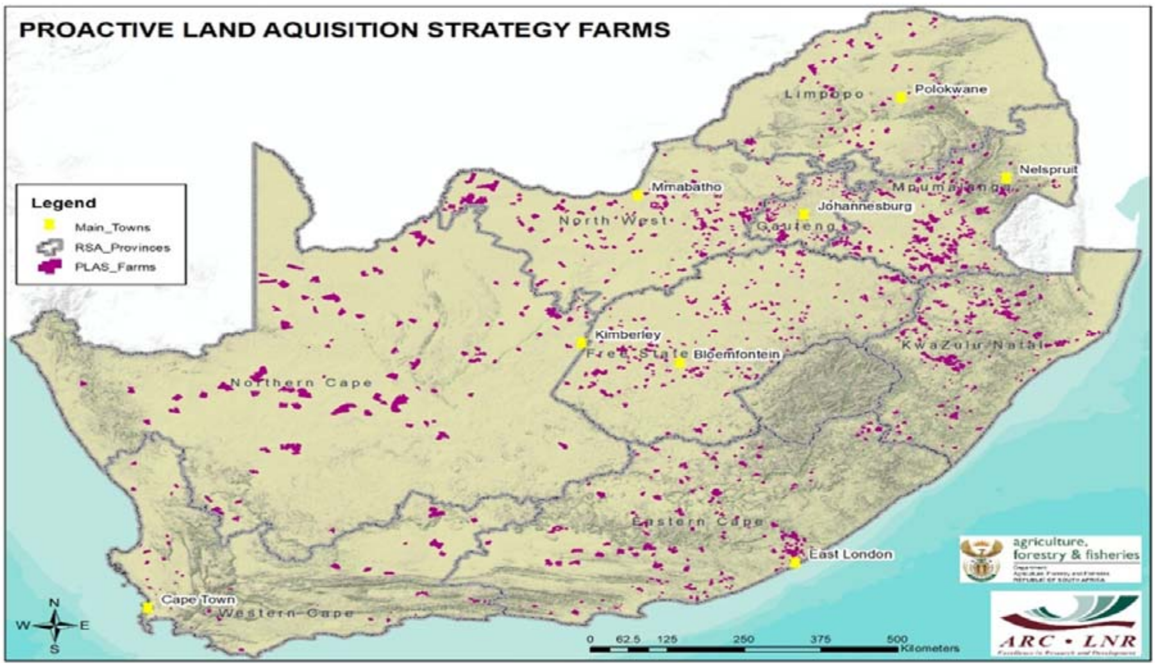

Figure 2. Location of PLAS farms in South Africa.

Using survey science customised for the PLAS evaluations, the survey focused on seven aspects:

1. Assets available for agricultural endeavour
2. Inputs and labour used in farm enterprises
3. Technology and support utilisation by the beneficiary (farmer)
4. Production/productivity achieved
5. Income generated by the enterprise
6. Food security status of the beneficiary (farmer)
7. Social capital status of the beneficiary (farmer)

The survey constitutes the first cornerstone of the assessment. The second cornerstone entailed the use of geo-spatial data supported by satellite-based earth observations. This enabled mapping of the natural agricultural resources of each farm. The maps on a 1:50,000 scale use a land capability geo-spatial database compiled by DAFF (2019). These maps contain information on soil, climate and terrain as well as grazing capacity, used to derive agricultural potential and commodity suitability. Collectively the survey and agro-ecological maps formed the basis of the evaluation, providing the expert panel with the information required for analysis.

An expert panel using a trans-disciplinary process carried out the evaluations. Scientific disciplines included soil, natural resource management and geo-spatial science, agricultural economics, land use planning and commodity expertise in livestock, agronomy and horticulture.

Each farm constituted a set of unique characteristics, making up a set of commodity enterprises based on location, natural resource potential, farmer capability, preference and external factors, such as market options. This complex scenario required trans-disciplinary, systemic analysis, integrating all factors that determine viability. Facilitating a participatory process in which these forms of expertise were exploited provided balance and safeguarded against bias. The panel considered sustainable development as point of departure, inclusive of equitable growth and respect for social rights and diversity, ensuring a holistic approach (Freimann, Ham, and Mijoč 2014). Combining sources of information including natural resource and survey data, and utilising trans-disciplinary expertise to evaluate options, enables reliable analysis (Ludovic et al. 2018).

Qualitative indices enriched the evaluation whilst bias was dealt with using an expert system approach to ensure an objective, transparent process. The approach was to weight the criteria equally, as the integrated farm performance chain is as strong as its weakest link. Failure in one of the links would impact on the enterprise as much as failure in any other. The use of the expert panel in the evaluation ensured that these indices provided a fair and reliable assessment.

The panel used agricultural commodity standards developed for more than 100 agricultural enterprises, describing output, price and production cost. These standards informed an optimal commodity mix suited to the farm's potential and the farmer's preferences. Commodities included livestock enterprises such as dairy, beef, mutton, wool, poultry and pork, as well as horticultural commodities. Also included were rain-fed field crops and pastures. Commodity organisations verified these standards, something which is now an established annual process, facilitated by Agricultural Research Council (ARC) experts. Comparing potential with actual farm output obtained through the survey enabled an objective perspective on land utilisation as well as the inclination and capability of the farmer.

The analysis also allowed for farm categorisation in terms of viability and a typology based on potential net income was used to categorise farms. Any deductive typology has limitations, but should consider diversity and enable a flexible development approach (Teixeira et al. 2018). Capturing differences in access to resources and services, aptitude and goals can assist in designing support according to farmer type. The PLAS typology included four farm types: commercial; medium scale; livelihood; and vulnerable farms. This aligned to the typology proposed by the Presidential Advisory Panel on Land Reform in South Africa, which categorised 30% of farmers as having limited access to land, 30% as smallholders with limited excess production, 30% as medium-scale farmers with aptitude to expand but facing resource limitations and 10% as commercial farmers with potential to grow (LRAAP 2019).

4. Panel evaluation process

The panel evaluation approach was broadly based on an environmental evaluation system that identifies key components and applies indicators to evaluate each component (Dee et al. 1973). The components used were natural resource potential, suitable commodity mix, optimal resource use (natural and physical), productivity, infrastructure status and farmer capability, as well as farm limitations and risks. For each component indices were identified as reflected in

Tables 2-8. Scoring was done on a three-tier classification, whereby 3 is good, 2 is satisfactory and 1 is poor. Indicator scores for each component were summed and then reduced to a component score of values 1–3 (as above) by dividing the score into bands based on panel consensus. This was also done for visualisation in a penta-graph (Figure 3). The scoring was based on a Delphi consensus methodology (Harold, Turoff, and Turoff 2002), considering system components in an iterative stepwise process.

4.1 Farm context

A high-level farm description provided an overview and orientated the panel. It established the farm's location, size and other relevant factors (see Table 1). Geographic location suggested typical suitable enterprises, indicating production capacity. Farm size, land use patterns and socio-economic information assisted the panel in considering the realities and potential of the farm, related to industry and marketing opportunities.

Table 1. Contextual information of a farm (example).

CRITERIA	FARM SPECIFICS
Size (Ha)	838.24
Arable land area (Ha)	300
Grazing land area (Ha)	538
Price paid (ZAR)	R5,678,910.61
Nearest town	Ermelo
Farmer experience (years)	40
Gender	Male
Age	55
Education	Secondary
Water rights	No

4.2 Natural resource scoring

The panel established a natural resource score for the land in question, based on a geo-spatial natural resource database, in conjunction with recent and historical high-resolution satellite imagery. Establishing the capability of its natural resources determined a farm's potential. Long-term land use potential for rain-fed farming defines land capability, determined by the interaction of climate, soil and topography (DAFF 2019). The combined natural resources data for the land type in which the farm is situated allowed the panel to establish objective capability scores. Whilst the scoring system was simplistic, extensive data informed the calculations. Table 2 describes the assessment.

Table 2. Natural resource (NR) assessment (example).

NR type	Area (Ha)	Weight (area/total area)	Capability	Score (weight × capability)
Soil capability – arable land	0	0	0	0
Soil capability – irrigable land	100	0.49	2.00	0.99
Rangeland capability	102	0.50	3.00	1.51
Infrastructure-based intensive land	0.0	0.0	0.0	0.0
Total productive area	202			
Climate capability				2
Rainfall (mm) and temperature (°C)				841/21
Topography				2.00
Water availability				2.00
Degradation				0.0
Total score out of 12				8.5
Total score out of 3				**2.13**

The natural resource score is an index that described potential as good, fair or poor. A score of up to four was considered poor, between five and eight was considered fair and from nine to 12 was considered good. The panel recorded degradation, if evident, by analysing satellite imagery and considering survey data on farm practices. Where degradation was evident, the team subtracted points from the index figure, depending on the level of degradation.

The national database used is primarily suitable on a 1:50,000 scale and represents a high-level resource capability assessment. It is suitable for farm-level planning, but variance due to scale is possible. However, combined with survey information, satellite imagery and the panel's expertise, the process ensured integrated analysis of the farm's potential production at farm scale.

4.3 Commodity selection

Based on the natural resource score, the panel identified suitable commodities (Table 3). Location, profile, farm history and marketing trends guided the expert panel. The panel proposed alternatives if current commodities were not sustainable or did not utilise farm resources optimally.

Table 3. Viability and profitability assessment of an illustrative high potential mixed farm.

Commodity	Detail	Optimal number or Area (Ha)	Annual offtake	Price /unit	% Production costs	Potential Net income
Livestock	Beef	520	364 calves	R6,500	0.35	R1,537,900
	Sheep	1732	1732 lamb	R1,600	0.35	R1,801,280
Field crops	Maize (irrigate)	100	10 t/ha	R2,600	0.85	R390,000
	Soya	100	4 t/ha	R5,000	0.80	R400,000
	Planted pasture	150	12 t/ha			Used on farm
Fruits	Nectarines	10	25 t/ha	R11,500	0.75	R718,750
Vegetables	Potato (irrigate)	100	5000 kg/ha	R3.50	0.85	R262,500
Potential annual gross income (return on investment)						R5,110,430
Viable – (good (3) fair (2) poor (1))						3

4.4 Comparing potential and actual performance–profitability assessment

The performance of enterprises currently on the farm was determined by production data collected during the survey. The panel compared this with potential productivity of the commodities it selected. The comparison (Tables 3 and 4) put current farm performance in perspective.

Table 4. Current commodity performance of an illustrative farm.

Commodity	Detail	Actual # or Area (Ha)	Composition (Male < Female < Young)	Reproduction % / Yield	Production cost (%)	# Sold	Price/ unit	Income obtained
Livestock	Beef	250	7, 173, 70	40%	0.35	55	7500	R268,125
	Goats	3000	300, 2221, 479	33%	0.2	1568	800	R1,003,520
Field crops	Maize	300 ha		3 t/ha	0.7	900 t	2600	R702,000
Vegetables	Tomatoes	2 ha		10 000 kg	0.7	20 t	R6/kg	R36,000
Actual net income obtained								R2,009,645
Current productivity (good [3], fair [2], poor [1])								3

4.5 Return on investment

A simplified return on investment (ROI) calculation of potential and actual productivity based on farm investment provided a sense of farm value (Table 5). Comparing the ROI with the rate at which financing can be obtained from a financial institution indicated the investments' opportunity cost. The potential and actual ROI scores were described as low, medium or high. A return on investment below 5% was considered poor (as interest on cash deposit exceeds this), between 5% and 10% fair (deemed a fair return compared to similar risk investments) and above 10% as good (return exceeds similar alternative risk investments).

Table 5. Return on Investment.

ADD HEADING		ADD HEADING	
Investment in farm (purchase price + recap)		R2,889,562,00	
Potential production	R648,000.00	% Potential annual Return on Investment	22.4
Actual production	R527.00	% Actual annual Return on Investment	18.3
		Prime lending rate %	10.25
This project has a		Good return on investment	

4.6 Infrastructure scoring

A farm infrastructure score was determined using another compound index, in terms of quality (condition) and quantity (sufficiency) of five essential types of infrastructure (Table 6) scored as low (1), medium (2) or high (3). Farm survey data, satellite imagery and panel insights informed the scoring. The panel regarded an index of below 15 as poor, 15–24 fair and above 24 as good.

Table 6. An example of farm infrastructure scoring, using five aspects and two criteria.

Asset type	Condition (based on inventory)	Sufficient to farm (panel)
Staff housing	2	1
Production infrastructure (immovable assets [e.g., sheds])	3	2
Fencing	3	2
Water equipment	3	3
Production equipment (e.g., tractors, scales)	3	2
Total		24
Sufficient and suitable infrastructure		FAIR

4.7 Farmer capability scoring

Farmer capability scoring (Table 7) entailed evaluating the operator's ability to manage the farm, assessed through a compound index of four criteria: productivity achieved; sustainability of management decisions (i.e., stocking rate, cultivation practices, input use); farm condition (fences, housing, equipment, immovable assets); and, lastly, utilisation of support and technology. These criteria considered the quality of management decisions and combined provided an objective farmer capability index. An index of four and below was deemed poor, 5–9 as fair and above nine as good. The three-tier system and thresholds were based on panel consensus in terms of what was considered accurate for sustainable farming. This allowed for consistent comparisons.

Table 7. Farmer capability**.**

Skill indicators	Score
Productivity achieved	2
Farm condition – is infrastructure maintained, e.g., fencing, buildings, equipment	3
Sustainability – is farm sustainable managed (erosion, degradation, overstocking, nutrient mining)	2
Support utilisation – is support used effectively (mentor, partner, extension, link to coop)	2
Total score (12)	9
This beneficiary's capability is:	FAIR

4.8 Determining risks and limitations

The extent of inherent limitations to achieving sustainable production, such as limited water availability, a lack of skills or infrastructure, poor support, degradation or inaccessible finance, were established. Similarly, the panel considered and scored external risks and their severity in the geographic area. This included fire, encroachment of invasive biota, pests and diseases as well as crime. The panel based this assessment on survey data, the farm inventory, satellite imagery observations, natural resource information and geographic/location context.

The farm's potential risks and limitations (Table 8) were scored from zero (0) when the risk or limitation was deemed improbable; one (1) when deemed of a low probability; two (2) if significant; and three (3) if a severe impact was probable. A cumulative index below seven was deemed low, between 8 and 14 significant and above 15 meant the farm faced severe risks or limitations.

Table 8. Risks and limitations**.**

Risk	Severity score	Limitation	Severity score
Erosion	3	Water rights	3
Bush encroachment	0	Age/succession	1
Invasive plants	0	Infrastructure	2
Pests and diseases	0	Support (extension, mentor)	3
Security	3	Access to finance	3
Fire	0	Skills/expertise	3
Floods	0	Degradation	3
Water availability	0		
Total risk score	6	Total limitation score	18
Project risk rating:	MEDIUM	Limitation rating	HIGH

4.9 An evaluation summary

The pentagon visually summarised the farm's evaluation according to a five-factor system, extracted from the scores obtained in previous steps: natural resource capability; productivity/viability; infrastructure status; farmer capability and return on investment. The pentagon reflected scores allocated for potential and actual performance[1], summarising the assessment visually (Figure 3).

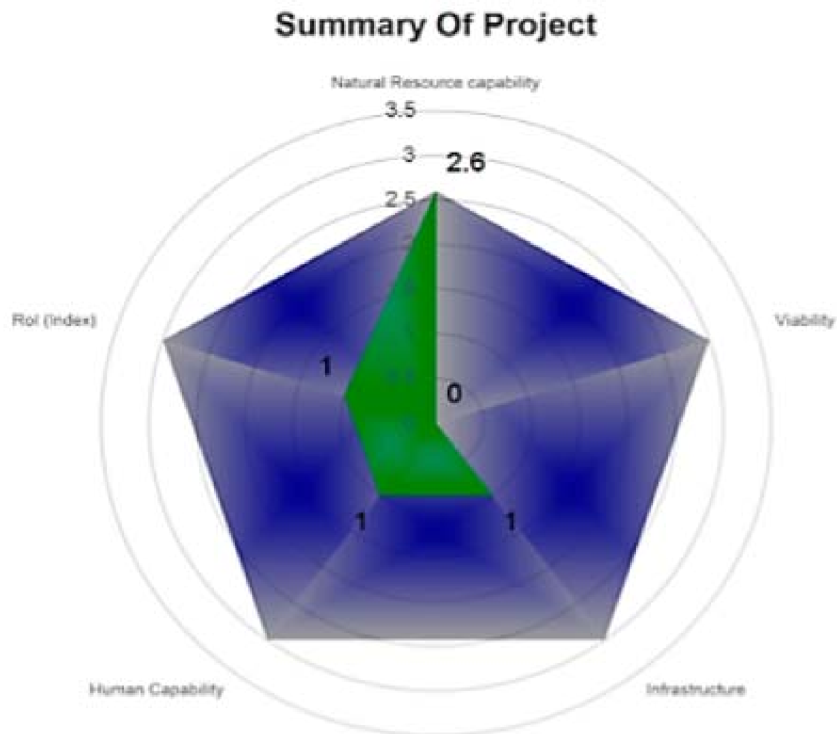

Figure 3. An overview of farm potential and performance.

Source: Authors' own compilation.

4.10 Farm specific recommendations

The final step constituted the application of the evaluation results into a set of recommendations. Comparing current farm productivity with its potential provided suggestions on how to close the gap, formulating intervention priorities. Optimal land use interventions and remedial action (if degradation was evident), were suggested. The panel highlighted priorities in terms of infrastructure requirements, as well as farmer development. The panel also offered investment considerations.

5. Results and discussion

A panel of experts evaluated the PLAS portfolio implementing the M&E methodology described above and compiled farm-level, provincial and national reports. The main results found in terms of the PLAS portfolio are summarised in Table 9, comparing a set of basic farm characteristics.

Table 9. A comparison of basic potential and actual PLAS farm performance variables.

Farm type	Commercial		Medium scale		Livelihood		Vulnerable	
Average farm size	1209 ha		743 ha		424 ha		185 ha	
Beneficiary score (%)	69		62		59		52	
Infrastructure score (%)	69		60		58		50	
Risk score (%)	58		60		60		62	
Limitation score (%)	45		51		54		60	
	Actual	Potential	Actual	Potential	Actual	Potential	Actual	Potential
Farm type %	7%	59%	8%	24%	18%	10%	67%	7%
Average NR* score	2.10	2.13	2.02	2.01	1.93	2.00	1.90	2.02
Average NFI** (R million)	1.94	2.25	0.472	0.511	0.227	0.246	0.044	0.056

*Natural resource; **Net farm income.

Farms categorised as commercially viable were ±1200 hectares in size on average across the country, with lower-potential farms being progressively smaller. A steep reduction in size from commercial to vulnerable farms was evident, indicating that size is important, especially for extensive enterprises such as livestock and dryland cropping. Intensive enterprises such as poultry or horticulture were less dependent on land size, but rely on sufficient water, often a limiting resource.

Most PLAS farms (59%) were potentially commercial, able to generate net farm income above R700,000 per annum (a benchmark set at the time). Another 24% of farms had potential to generate net farm income of between R350,000 and R699,000. This indicated that in terms of the objective of establishing commercial farms, the State in most cases procured viable farms.

However, based on actual productivity, only 7% of farms recorded a net farm income above the commercial benchmark. On 67% of all PLAS farms, the actual net income was below R150,000 per annum. More than half the PLAS farms reported no production during the previous year. More than half the beneficiaries scored a low capacity to achieve commercial success. This indicated that the programme had been unsuccessful in establishing commercial farmers and corroborates the work of other authors (Kirsten et al. 2016; Maka and Aliber 2019; Zantsi and Greyling 2021). The analysis indicated that ± R3billion of possible annual income from the PLAS portfolio remained unexploited, with a realised combined net farm income of less than 20% of potential. This has food security, development and economic growth implications. In essence, PLAS farm performance was poor due to poorly selected, poorly equipped and poorly supported farmers.

The analysis established a correlation between farming capability and farm performance. As farm viability decreased, so too did the associated beneficiary score. This indicated the importance of beneficiary selection, based on the criteria of entrepreneurial aptitude, resilience and technical skills for PLAS success in the future. A successful PLAS beneficiary typically had a sound education, was integrated into a support network, had functional infrastructure and diversified into more than two commodity enterprises. These findings confirmed *a priori* expectations in terms of basic requirements.

Infrastructure scores correlated with farm performance and investment in infrastructure determined success to a degree. All types of farm infrastructure (equipment, fixed assets, water reticulation, fencing and housing) were generally poor, and beneficiaries reported this as the main challenge in livestock production; it was also the second most limiting factor in crop production, impacting significantly on competitiveness, which, in turn, limited market penetration. Since most PLAS farms had low production levels, access to formal, especially high-value, markets was problematic. The market typically demands consistent supply of quality produce, often not achieved by PLAS farms. Similarly, off-farm infrastructure, such as poor roads, was a marketing challenge, as it repelled potential buyers and increased the cost of transport, lowering market integration and trade.

Notably, 7045 full-time workers were employed on PLAS farms at the time of evaluation, with another 12,000 workers holding temporary jobs. On average a PLAS farm employed six full-time and four part-time workers. However, based on the potential of these farms, a total of 60,050 workers could be employed had the farms been optimally productive. Since a major state objective is job creation, this constituted a significant PLAS failure.

The main PLAS limitation was low levels of post-settlement support. Even significant investment in a recapitalisation programme generally yielded lower returns than expected. Whilst recapitalisation influenced infrastructure availability and condition and created some job opportunities, it failed to significantly improve productivity and farm income, thus failing to facilitate integration of PLAS farmers into commercial value chains. Recapitalisation shortcomings included limited accountability by the appointed support institutions and even reported misuse of funds. Little M&E was evident, which resulted in service providers not being held accountable beyond a high level of bookkeeping. Furthermore, inefficient funds disbursement made it difficult for beneficiaries to achieve their goals. These findings emphasise the importance of post-settlement support in terms of access to services (extension, information) and resources (capital). As expected, the risks and limitations that PLAS farmers faced were significant, and as these scores increased, farm viability decreased.

The analysis revealed that the PLAS programme focused on establishing commercial farmers and ignored rural diversity, whilst smaller enterprises could also have been accommodated. The typology analysis done supported this view, and aligns with evidence documented earlier (Drimie 2016; Hall 2009; LRAAP 2019; Okunlola et al. 2016; Teixeira et al. 2018).

Limited post-settlement support and ignoring diversity were the main contributing factors to the programme's failure. Analysis confirmed the importance of considering the natural resource base for sustainable, viable land use. It emphasised the importance of investment in capacity-building and infrastructure. It revealed that performance on most PLAS farms was not in line with potential, indicating a lack of impact and a need for policy adjustment.

6. Conclusions and recommendations

The evaluation established a significant gap between potential and actual performance on PLAS farms. Potential annual income of the roughly 2000 farms was estimated conservatively at ±R3billion collectively, whilst actual performance was less than a quarter of this. The analysis provided reasons for the gap, which informed policy recommendations.

On many PLAS farms, improved management facilitated by access to effective support and skills development should result in better performance. Improved coordination between government institutions, organised agriculture and civic associations is required to improve support. Lack of access to credit results in capital shortages for enterprise development. Hence, facilitating credit access from private financial institutions should be a priority. Transferring farm title deeds to PLAS farmers that have proven their capability should be considered, as it would facilitate access to capital.

Restrictive limitations and risks such as pests and diseases, crime, low skill levels and poor infrastructure should be addressed through integrated measures providing access to training, access to capital and market information, which should enhance value-chain integration.

These insights gained were submitted to the State in a PLAS analysis report, to guide strategy improvement. In the main, sound beneficiary selection, national stakeholder collaboration in support and collective mobilisation were main recommendations made to improve access to resources (funding, infrastructure) and services (skills development), as this should enhance PLAS farms' productivity. A coordinated inter-institutional focus on M&E should also add value.

The methodology described constitutes a scientific tool to evaluate agricultural development, including land-reform initiatives. The stepwise, participatory process, using qualitative and quantitative data in a systemic trans-disciplinary approach, safeguards objectivity. The process is visual, sequential and easy to interpret, facilitating informed decision-making. It is scientifically sound, based on objective criteria and useful in guiding policy.

Possible limitations of the proposed methodology include the requirement for extensive data, which implies the need to invest in data collection. Similarly, the tool requires evaluation by an expert panel, which entails an investment, especially in human capacity. Positively, the process allows farmers to participate in the M&E process and encourages record-keeping. It enables appropriate, targeted intervention that should increase land reform success. The toolkit has been digitised and is currently used in evaluating agricultural development and land reform initiatives.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes

[1] One assumption is that scores for the five aspects can vary, depending on for instance farm suitability (size, or unproductive areas such as mountains, dongas, or encroached areas). This lowers potential viability and ipso facto return on investment. Potential beneficiary capability and infrastructure always scores at 3, to indicate optimal infrastructure and a capacitated, motivated farmer. Hence, for these two criteria, the potential is always at level three.

References

Ahmed, E., J. Xiyun, and Y. Shihong. 2018. Performance evaluation of irrigation projects: Theories, methods, and techniques. *Agricultural Water Management* 203 (ISSN0378-3774): 87–96. doi:10.1016/j.agwat.2018.02.034.

Binswanger-Mkhize, H.P. 2014. From failure to success in South African land reform. *African Journal of Agricultural and Resource Economics* 9, no. 4: 253–269. doi:10.22004/ag.econ.197014.

Chopin, P., C.P. Mubaya, and K. Descheemaeker. 2021. Avenues for improving farming sustainability assessment with upgraded tools, sustainability framing and indicators. A review. *Agronomy for Sustainable Development* 41: 19. doi:10.1007/s13593-021-00674-3.

Cruz, J.F., Y. Mena, and V. Rodríguez-Estévez. 2018. Methodologies for assessing sustainability in farming systems. *Sustainability Assessment and Reporting. InTech*. doi:10.5772/intechopen.79220.

Dee, N., J. Baker, N. Drobny, K. Duke, I. Whitman, and D. Fahringer. 1973. An environmental evaluation system for water resource planning. *Water Resources Research* 9, no. 3 June: 523–535. doi:10.1029/WR009i003p00523.

Dept of Agriculture, Forestry & Fisheries (DAFF). 2019. National land capability evaluation raster data layer. 1791874_Lanele_FEIAR_FINAL_20191002_Appendix_E_Soil%20(1).pdf.

Diao, X., M. McMillan, and D. Rodrik. 2019. The recent growth boom in developing economies: A structural-change perspective. In *The Palgrave handbook of development economics*, edited by M. Nissanke and J.A. Ocampo. Cham: Palgrave Macmillan. doi:10.1007/978-3-030-14000-7_9

Drimie, S. 2016. Understanding South African food and agricultural policy: Implications for agri-food value chains, regulation, and formal and informal livelihoods. Working Paper 39. PLAAS, UWC &Centre of Excellence on Food Security. https://foodsecurity.ac.za/wp-content/uploads/2018/07/PlaasWP39Drimie_0.pdf.

Food and Agriculture Organization (FAO). 2010. Land reform: Land tenure and rural development. http://www.fao.org/3/i2143e/i2143e01.pdf.

Freimann, A., M. Ham, and J. Mijoč. 2014. Measuring objective well-being and sustainable development management. *Journal of Knowledge Management, Economics and Information Technology* 2: 1–29.

Haddad, L., J. Lindstrom, and Y. Pintoi. 2010. The sorry state of M&E in agriculture: Can people-centred approaches help? *IDS Bulletin* 41, no. 6: 6–25.

Hall, R. 2009. Dynamics in the commercial farming sector. In *Another countryside*, edited by Ruth Hall, 120–131. Cape Town: Institute for Poverty, Land and Agrarian Studies.

Harold, A., L. Turoff, and M. Turoff, eds. 2002. The Delphi method: Techniques and applications https://web.archive.org/web/20080520015240/http://is.njit.edu/pubs/delphibook/.

Jayne, T., J. Chamberlin, S. Holden, H. Ghebru, J. Ricker-Gilbert, and F. Place. 2021. Rising land commodification in Sub-Saharan Africa: Reconciling the diverse narratives. *Global Food Security* 30: 100565. doi:10.1016/j.gfs.2021.100565.

Khan, N., R.L. Ray, G.R. Sargani, M. Ihtisham, M. Khayyam, and S. Ismail. 2021. Current progress and future prospects of agriculture technology: gateway to sustainable agriculture. *Sustainability* 13: 4883. doi:10.3390/su13094883.

Kirsten, J.F., C.L. Machete, T. Ndlovu, and P. Lubambo. 2016. Performance of land reform projects in the North West province of South Africa: Changes over time and possible causes. *Development Southern Africa* 33, no. 4: 442–58.

Liebenberg, F., P. Pardey, and M. Kahn. 2010. South African agricultural research and development: A century of change. InSTePP Paper 10-1 January 2010. College of Food, Agricultural and Natural Resources Sciences, University of Minnesota. doi:10.22004/ag.econ.56688.

Lindstrom, J. 2009. What is the state of M&E in agriculture? Findings of the ALINe online consultation survey. Institute of Development Studies. http://pool.fruitycms.com/aline/Downloads/what-is-the-state-of-mande-in-agriculture.pdf.

Lipton, M. 2009. *Land reform in developing countries: Property rights and property wrongs*. London: Routledge, p. 384. ISBN 978 0 415 09667

Lowder, S.K., J. Skoet, and T. Raney. 2016. The number, size, and distribution of farms, smallholder farms, and family farms worldwide. *World Development* 87 (November 2016): 16–29. doi:10.1016/j.worlddev.2015.10.041.

Lraap (Land Reform and agriculture Advisory Panel). 2019. *Final report of the presidential advisory panel on land reform and agriculture*. Pretoria: The Presidency.

Ludovic, T., D. Barret, G. Blundo-Canto, M. Dabat, A. Devaux-Spatarakis, G. Faure, E. Hainzelin, S. Mathe, A. Toillier, and B. Triomphe. 2018. Assessing Impacts of Agricultural Research for Development: A systemic model focusing on outcomes. *Research Evaluation*. 27, no. 2, 157–170. https://doi.org/10.1093/reseval/rvy005

Maka, L., and M.A. Aliber. 2019. The role of mentors in land reform projects supported through the recapitalisation and development programme: Findings from Buffalo city metropolitan municipality, South Africa. *South African Journal of Agricultural Extension* 47, no. 2: 37–45.

Makombe, G. 2018. Land reform in SA: The conversation that never took place. *The Qualitative Report* 23, no. 6: 1401–1421. doi:10.46743/2160-371502018.3232.

Mtero, F., N. Gumede, and K. Ramantsima. 2023. Elite capture in South Africa's land redistribution: The convergence of policy bias, corrupt practices and class dynamics. *Journal of Southern African Studies* 49, no. 1: 5–24. doi:10.1080/03057070.2023.2187969.

Muller-Praefcke, D., K. Lai, and W. Sorrenson. 2010. The use of monitoring and evaluation in agriculture and rural development projects. Findings from a review of implementation completion reports. FAO. https://www.fao.org/3/am292e/am292e.pdf

Nor Diana, M.I., N.A. Zulkepli, C. Siwar, and M.R. Zainol. 2022. Farmers' adaptation strategies to climate change in Southeast Asia: A systematic literature review. *Sustainability* 14: 3639. doi:10.3390/su14063639.

Okunlola, A., M. Ngubane, B. Cousins, and A. du Toit. 2016. Challenging the stereotypes: Small-scale black farmers and private sector support in South Africa. PLAAS, UWC. https://www.africaportal.org/publications/challenging-the-stereotypes-small-scale-black-farmers-and-private-sector-support-programmes-in-SA-a-national-scan/.

Place, F. 2009. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms. *World Development* 37, no. 8: 1326–1336.

Schindler, J., F. Graef, and H. König. 2015. Methods to assess farming sustainability in developing countries. A review. *Agronomy for Sustainable Development* 35: 1043–1057. doi:10.1007/s13593-015-0305-2.

Sihlobo, W., and J. Kirsten. 2019. *A compendium of essays on land reform in South Africa*. Co-published by AgBIZ and Stellenbosch University. agbiz.co.za/uploads/AgbizNews18/181207_Land%20Reform%20Essays%20Final.pdf

Simtowe, F., M. Mendola, J. Mangisoni, H. Tchale, and C. Nyirongo. 2013. The economic effects of land redistribution: The case of a community-based rural land development project in Malawi. In *Land tenure reform in Asia and Africa*, edited by S.T. Holden, K. Otsuka, K. Deininger, 105–133. London: Palgrave Macmillan. doi:10.1057/9781137343819_5

Teixeira, H., L. van den Berg, M. Cardoso, A. Vermue, F. Bianchi, M. Peña-Claros, and P. Tittonell. 2018. Understanding Farm Diversity to Promote Agroecological Transitions. *Sustainability*, 10, no. 12: 4337. https://doi.org/10.3390/su10124337

United Nations. 2020. The 2030 agenda for sustainable development. https://www.un.org/sustainabledevelopment/sustainable-development-goals/.

Van Mil, H., Z. Foegeding, E. Windhab, N. Perrot, and E. Van der Linden. 2014. A complex system approach to address world challenges in food and agriculture. *Trends in Food Science & Technology* 40, no. 1: 20–32. doi:10.1016/j.tifs.2014.07.005.

Vink, N., and J. Kirsten. 2019. Principles and practice for successful farmland redistribution in SA. PLAAS, UWC, http://repository.uwc.ac.za/xmlui/handle/10566/4653.

World Bank. 2014. Land Reform Overview. https://land-links.org/land_library/land-reform-overview/.

Zantsi, S., and J.C. Greyling. 2021. Land redistribution in South Africa’s land reform policy: A better way to select beneficiaries. *Agrekon* 60, no. 2: 108–127. doi:10.1080/03031853.2021.1906286.