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FULL PAPER

Perceptions on the Constraints to Agroforestry Competitiveness: A Case Study of Agrosilviculture Community Growers in Limpopo and Mpumalanga Provinces, South Africa

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Abstract
Agroforestry is a land-use system that includes the use of woody perennial, agricultural crops, and animals in combination to achieve beneficial ecological and economical interactions for food, fiber, and livestock production. However, limited understanding, incorrect information, and a negative mindset could hinder the competitiveness of this practice. This case study of agrosilviculture community growers attempts to explain the grower's constraints to agroforestry competitiveness by analyzing their agroforestry perception. Hence, the study was aimed to document grower's perception on the constraints to agroforestry competitiveness in Limpopo and Mpumalanga Provinces. Quantitative and qualitative designs were used as a questionnaire written in English, and stakeholder's discussion and field observations were part of the data collection. A purposive sampling technique was used to select 182 agrosilviculture community growers from 30 villages. Data was coded, captured, and analyzed using SPSS. The results indicated that the production factors, demand conditions, related and supporting industries, government support, chance, and quite a few community growers indicated that the market was causing a decrease in agroforestry competitiveness as the majority of growers strongly agreed and agreed respectively. The results further indicated that firm strategy, structure, and rivalry were not causing a decrease in agroforestry competitiveness as the majority of growers strongly disagreed and disagreed. In conclusion, identified community growers' perceptions are in line with some of the researcher's field observations, and it is thus recommended that stakeholders should take note of the constraints identified by the agrosilviculture community growers in an attempt to increase agroforestry competitiveness in South Africa.

Keywords Agrosilviculture community growers · Agroforestry · Perceptions · Limpopo Province · Mpumalanga Province · South Africa

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Introduction

Agroforestry (AF) is a land-use system that includes the use of woody perennial, agricultural crops, and animals in combination to achieve beneficial ecological and economical interactions for food, fiber, and livestock production. According to [1], several criteria can be used to classify and group AF systems (and practices). The following are the most commonly used criteria: the system's structure (composition and arrangement of components), its function, its socio-economic scale and level of management, and its ecological spread. According to [1], structurally, the system can be grouped as agrosilviculture (crops—including tree/shrub crops—and trees), silvopastoral (pasture/animals + trees), and agrosilvopastoral (crops + pasture/animals + trees). The researcher further indicated that other specialized AF systems, such as apiculture with trees, aquaculture in mangrove areas, and multipurpose tree lots, could also be specified. According to [1], the arrangement of components can be in time (temporal) or space (spatial), and several terms are used to denote the various arrangements. Functional basis refers to the main output and role of components, especially the woody ones. These can be productive functions (production of "basic needs" such as food, fodder, fuelwood, and other products) and protective roles (soil conservation, soil fertility improvement, and protection offered by windbreaks and shelterbelts). On an ecological basis, systems can be grouped for any defined agro-ecological zone such as lowland humid tropics, arid and semi-arid tropics, and tropical highlands.

The socio-economic scale of production and level of management of the system can be used as the criteria to designate systems as commercial, "intermediate," or subsistence. Each of these criteria has merits and applicability in specific situations, but they have limitations too so that no single classification scheme can be accepted as universally applicable. Classification will depend upon the purpose for which it is intended [1]. According to [2], these groups can further be subdivided as either simultaneous (where trees and crops are grown simultaneously), or sequential (where trees and crops are grown separately, temporally, over a number of seasons, as with improved fallows). However, limited understanding, incorrect information, and a negative mindset could hinder the competitiveness of this practice. This case study of agrosilviculture community growers in Limpopo and Mpumalanga Provinces, South Africa attempts to explain the farmers' constraints to agroforestry competitiveness by analyzing their perception on agroforestry. Hence, the study was aimed to document agrosilviculture community grower's perceptions on the constraints to agroforestry competitiveness in Limpopo and Mpumalanga Provinces.

Methodology

All the research done so far with partners (South African Forestry Company Limited, Department of Forestry & Fisheries, Universities of KwaZulu Natal, Pretoria & Mpumalanga) is focused on achieving or working towards a participatory research approach since the researcher, collaborators, extension officers, farmers, and funder were actively involved in all phases. According to [3], the method of participatory action research is most appropriate since people especially farmers benefit while the research is ongoing. The participatory action approach was also recommended by various researchers who emphasized that the participatory action approach is a good alternative to the traditional "transfer of technology" or "top-down approach" to agricultural research and extension. It is against

this background that the approach was used to achieve the research objective. The research used quantitative and qualitative methods. A detailed questionnaire written in English was developed as a quantitative data collection method. The qualitative data collection methods included focus group discussions and field observations. A total of 182 agrosilviculture community growers from 30 villages participated in the study and were spread as follows: Vhembe District (43), Mopani District (62), and Ehlanzeni District (77). Quantitative and qualitative designs were used as a questionnaire written in English, and stakeholder's discussion and field observations were part of the data collection. A purposive sampling technique was used to select 182 agrosilviculture community growers from communities that were allocated land by South Africa Forestry Company Limited (SAFCOL); Mountain to Ocean (MTO) Forests, White River; Ratombo Plantations, and Dimani. Each agrosilviculture community grower was allocated a row of m2 as follows for production: (1) SAFCOL (3226m2 : 1ha = 10000m2; 20ha * 10000 = 200000m2/62); (2) MTO (1272m2 : 1ha = 10000m2; 9.8ha * 10000 = 98000m2/77); Dimani (1351m2 : 1ha = 10000m2; 5ha * 10000 =50000m2/37) and Ratombo Plantation (3333m2 : 1ha = 10000m2; 2ha * 10000 =20000m2/6). The eucalyptus trees were then integrated with other crops including maize, sweet potatoes, beans, groundnuts, bambara nuts, and vegetables. Socio-economic data was analyzed quantitatively using the Statistical Package for Social Sciences (IBM SPSS Statistics) windows version. According to [4], an agroforestry project will be more successful if the diversity of smallholder socio-economic characteristics and their perceptions are considered in its design (Fig. 1).

Results and Discussions

The results indicated that the production factors (Table 1) were causing a decrease in agroforestry competitiveness as the majority of community growers strongly agreed (total rating at 110) and agreed (total rating at 993). Among the thirteen factors of production, the cost of production (strongly agreed/agreed by 164 community growers), insufficient source of water (strongly agreed/agreed by 148 community growers), and labor (strongly agreed/agreed by 161 community growers) were perceived as the most important factors causing a decrease in agroforestry competitiveness. However, quite a number of community growers perceived production factors as not causing any decrease in agroforestry competitiveness (strongly disagree by a total rating of 294 and disagree by a total rating of 265). A total of 574 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

The demand conditions (Table 2) were causing a decrease in agroforestry competitiveness as the majority of farmers agreed (total rating at 323). Among the five demand conditions, distance to the market (agreed by 75 and not sure by 101 community growers), market information (agreed by 70 and not sure by 106 community growers), agroforestry market (agreed by 65 and not sure by 109 community growers), and cost to market (agreed by 69 and not sure by 105 community growers) were perceived as the factors mostly causing a decrease in agroforestry competitiveness. However, quite a number of community growers perceived demand conditions as not causing any decrease in agroforestry competitiveness (strongly disagree by a total rating of 14 and disagree by a total rating of 45). A total of 525 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

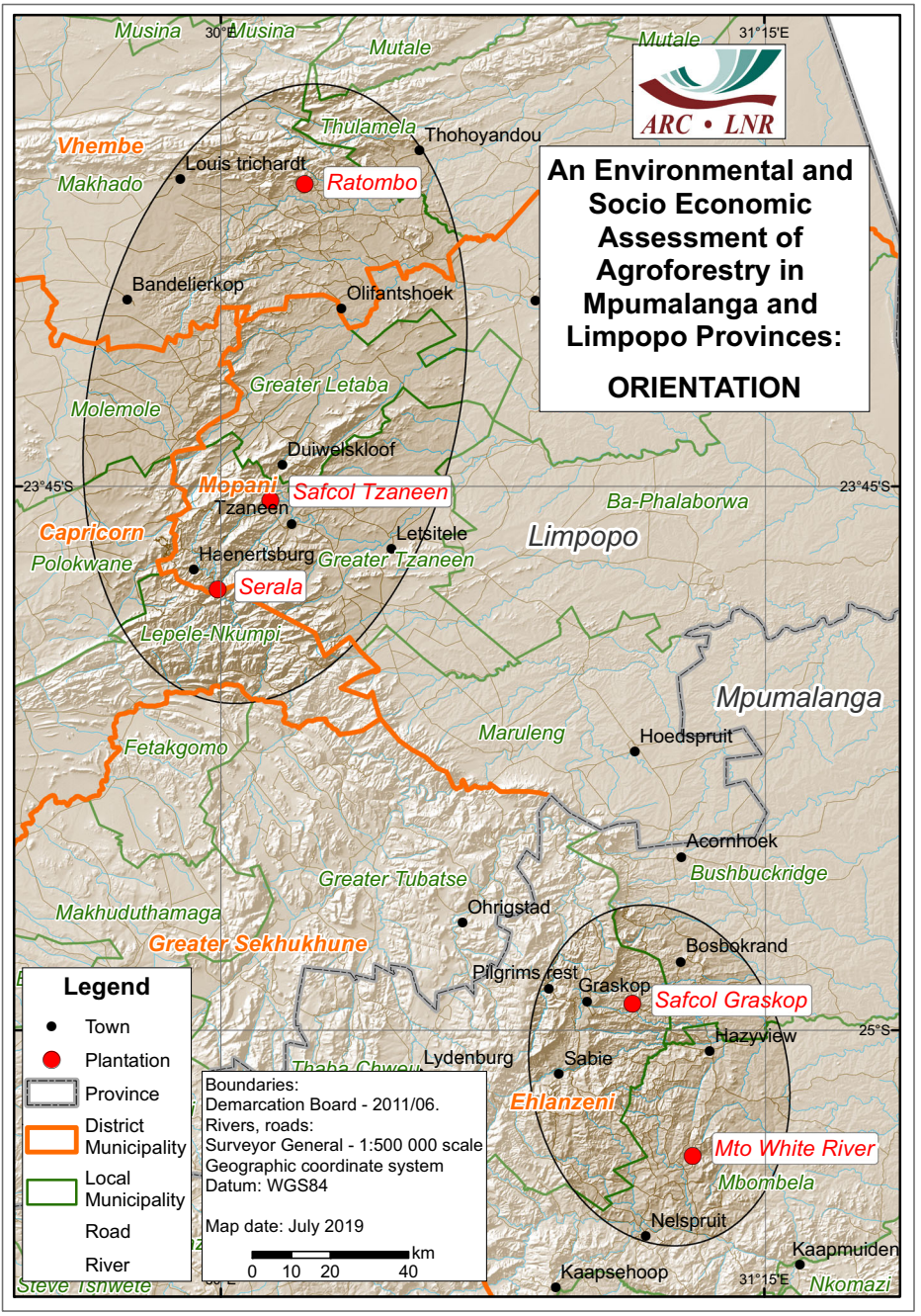

Fig 1 Location of the agrosilviculture community growers in Limpopo and Mpumalanga Provinces

In addition, related and supporting industries (Table 3) were causing a decrease in agroforestry competitiveness as the majority of community growers strongly agreed (total rating at 95) and agreed (total rating at 174). Among the four related and supporting industries, financial

Table 1 Production factors causing a decrease in agroforestry competitiveness

Views The following production factors are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Cost of production	12	0	6	131	33
Labor	14	1	6	144	17
Cost of unskilled labor	30	9	46	94	3
Quality of unskilled labor	30	17	52	80	3
Availability of unskilled labor	30	20	57	72	3
Cost of skilled labor	29	31	86	33	3
Availability of skilled labor	30	38	85	26	3
Administration cost associated with labor matters	28	16	108	25	5
Insufficient source of water	12	4	18	130	18
Infrastructure	24	43	0	111	4
Lack of knowledge	35	60	49	35	3
Lack of technology	25	3	51	101	2
Capital/finance	23	23	10	113	13
Total responses	**294**	**265**	**574**	**993**	**110**

institutions (strongly agreed/agreed by 80 community growers), research institutions (strongly agreed/agreed by 72 community growers), and suppliers (strongly agreed by 62 community growers) were perceived as the factors mostly causing a decrease in agroforestry competitiveness. However, quite a number of community growers perceived related and supporting industries as not causing any decrease in agroforestry competitiveness (strongly disagree by a total rating of 43 and disagree by a total rating of 86). A total of 330 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

Government support (Table 4) was also causing a decrease in agroforestry competitiveness as the majority of community growers strongly agreed (total rating at 84) and agreed (total rating at 484). Among the six-government support, (1) land reform policy (strongly agreed/agreed by 151 community growers) and (2) poor interaction and support between government departments (strongly agreed/agreed by 102 community growers) were perceived as the factors mostly causing a decrease in agroforestry competitiveness. However, quite a number of community growers perceived government support as not causing any decrease in agroforestry competitiveness (strongly disagree by a total rating of 85 and disagree by a total rating of 212).

Table 2 Demand conditions causing a decrease in agroforestry competitiveness

Views The following demand conditions are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Distance to market	2	3	101	75	1
Market information	2	3	106	70	1
Cost to the market	2	5	105	69	1
Quality of products	6	28	104	44	0
Market for agroforestry	2	6	109	65	0
Total responses	**14**	**45**	**525**	**323**	**3**

Table 3 Related and supporting industries causing a decrease in agroforestry competitiveness

Views The following related and supporting industries are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Financial institutions	2	18	82	50	30
Research institutions	4	22	84	44	28
Suppliers	14	25	81	39	23
Electricity suppliers	23	21	83	41	14
Total responses	**43**	**86**	**330**	**174**	**95**

A total of 484 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

The results further indicated that firm strategy, structure, and rivalry (Table 5) were not causing a decrease in agroforestry competitiveness as the majority of community growers strongly disagreed (total rating at 406) and disagreed (total rating at 78). Among the five firm strategy, structure, and rivalry, (1) culture (strongly disagreed/disagreed by 107 community growers), (2) structure (strongly disagreed/disagreed by 97 community growers), and (3) adaptability (strongly disagreed/disagreed by 91 community growers) were perceived as the factors mostly not causing decrease in agroforestry competitiveness. However, quite a number of community growers perceived firm strategy, structure, and rivalry as causing a decrease in agroforestry competitiveness (strongly agree by a total rating of 11 and agree by a total rating of 144). A total of 271 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

Quite a few community growers indicated that the market (Table 6) was causing a decrease in agroforestry competitiveness as some community growers agreed (total rating at 63). Among four market conditions, (1) threat of substitutes (strongly agreed/agreed by 22 community growers) and (2) market power of buyers (strongly agreed/agreed by 13 community growers). However, quite a number of community growers perceived the market as not causing any decrease in agroforestry competitiveness (strongly disagree by a total rating of 29 and disagree by a total rating of 45). A total of 619 of total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

Chance (Table 7) was again causing a decrease in agroforestry competitiveness as the majority of community growers strongly agreed (total rating at 67) and agreed (total rating at

Table 4 Government support causing a decrease in agroforestry competitiveness

Views The following government support are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Poor interaction and support between government department	2	45	33	66	36
Indirect support	4	39	78	37	24
Trade policy	28	12	101	39	2
Land reform policy	9	3	19	129	22
Labor policy	21	12	119	30	0
Fiscal policy	20	113	134	15	0
Total responses	**85**	**212**	**484**	**484**	**84**

Table 5 Firm strategy, structure and rivalry causing a decrease in agroforestry competitiveness

Views The following firm strategy, structure, and rivalry are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Adaptability	79	12	63	27	1
Culture	82	25	48	25	2
Structure	82	15	48	35	2
Flexibility	82	14	50	33	3
Pricing strategy	81	12	62	24	3
Total responses	**406**	**78**	**271**	**144**	**11**

521). Among nine chance, (1) drought (strongly agreed/agreed by 169 community growers) and (2) crime (strongly agreed/agreed by 131 community growers) were perceived as the most factors causing a decrease in agroforestry competitiveness. However, quite a number of community growers perceived chance as not causing any decrease in agroforestry competitiveness (strongly disagree by total rating of 279 and disagree by a total rating of 209). A total of 562 of the total rating fell in the "not sure" response. These results trends are in line with studies conducted in Limpopo Province [5–7].

Implications of Agroforestry in Post-Covid Era

Agroforestry has provided a lifeline for the agrosilviculture community growers post-covid era as their level of food insecurity was flattened. A whopping 163 agrosilviculture community growers indicated that they can now access food as the land allocated and production inputs given by South Africa Forestry Company Limited (SAFCOL), Mountain to Ocean (MTO), Department of Environment, Forestry and Fisheries (DEFF), and Agricultural Research Council (ARC) enabled them to produce food for themselves. Only 19 community growers indicated that they are still food insecure because of lack of transport money to monitor their land allocation, and in some instance, the animals destroyed their crops. Some community growers indicated that they were able to sell a minimum of 10 bags × 80 kg of groundnuts per row allocated. What is clear from the study is that the successful development and implementation of an agroforestry system that suites a particular local area will require, most importantly, an enabling environment (through a support policy and strategy), further research and development, and coordination and collaboration.

Table 6 Market causing a decrease in agroforestry competitiveness

1.Views The following market conditions are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Market power of suppliers	3	12	155	12	0
Market power of buyers	2	10	157	13	0
Threat of substitutes	2	13	153	22	0
Threat of new substitutes	2	10	154	16	0
Total responses	**9**	**45**	**619**	**63**	**0**

Table 7 Chance-causing decrease in agroforestry competitiveness

Views The following chance are causing the decrease in agroforestry competitiveness	Responses				
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Economic stability	19	11	118	30	4
Aids	34	34	84	30	0
Political stability	28	17	99	37	1
Price stability	24	17	91	46	4
Crime	30	11	10	112	19
Drought	3	6	4	139	30
Floods	47	32	49	51	3
Fires	47	40	51	41	3
Frost	47	41	56	35	3
Total responses	**279**	**209**	**562**	**521**	**67**

Conclusion and Recommendations

The Sustainable Development Goals encouraged all countries to address 17 social, environmental, and economic goals that promote prosperity while protecting the planet, and agroforestry can support the attainment of these goals. The study highlighted that the promotion of agroforestry is important because it offers the prospect of increasing production and hence raising farmer income. Recognizing and tackling main perceptions and factors that determine the competitiveness of farmers in agroforestry practices are relevant to the adoption of agroforestry involving economic as well as sociological considerations. In conclusion, identified community growers perceptions namely production factors, demand, related, supporting industries, government support, firm strategy, structure, rivalry, market, and chance are in line with some of the researcher field observations, and it is thus recommended that stakeholders should take note of the constraints identified by the agrosilviculture community growers in an attempt to increase agroforestry competitiveness in South Africa.

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Data Availability Not Applicable.

Code Availability Not Applicable.

Declarations

Ethics Approval Ethical approval was received from the stakeholders, agrosilviculture community growers, and my employer (ARC).

Consent to Participate Consent to participate statement was included in the questionnaire for the respondents to read and sign before the interviews.

Consent for Publication The author gives consent for publication.

Conflict of interest No conflict of interests that are directly or indirectly related to the work submitted for publication.

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