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ORIGINAL RESEARCH

An Analysis of the Behavioural Persistence of Tree-growing Farmers in the Sudano-Sahelian Region of Cameroon

Eugene L Chia[1,3] · **Paxie W Chirwa**[1,2] · **Francis W Nsubuga**[1]

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Abstract

Tree-growing support programs are being implemented widely to enhance farmers' involvement in land restoration schemes. However, the reasons why farmers will continue to engage in restoration activities when support programs end, considered here as "behavioural persistence" has not been sufficiently explored. Taking the Mogazang landscape of Cameroon as a case study, a mixed methods approach involving farmers surveys, key informant interviews and the review of literature, was applied to investigate the factors that influence the behavioural persistence of tree-growing farmers. Drawing on the concept of behavioural persistence, the findings revealed that farmers decision to continue restoration practices on their farm plots after the end of support programs is influenced by a mix of factors, among which positive attitude and perception of farmers, constant motivation, financial profitability, community influence, played an important role. Findings also showed that farmers behavioural persistence aspects were not adequately addressed during the design of support programs and the inception phase of support programs did not prepare farmers psychologically about post support programs. This empirical investigation of farmers behavioural persistence has provided information that needs to be taken into consideration when assessing the feasibility, including the designing and implementation of planned tree-growing restoration support programs and related policies in Cameroon and other countries.

Keywords Landscape degradation · Restoration · Tree-growing · Behavioural persistence · Sustainability · Cameroon

✉ Eugene L Chia
lohchia@gmail.com

[1] Department of Geography, Geoinformatics and Meteorology, University of Pretoria, Pretoria, South Africa

[2] Postgraduate Forest Science Programme, Department of Plant and Soil Sciences, University of Pretoria, Pretoria, South Africa

[3] University of Pretoria, Private bag X20, Hatfield 0028, South Africa

Introduction

Land restoration has become a widespread human response to ecosystem and land degradation, caused by human activities. The response to ecosystem degradation is expected to cushion the ever-increasing threat to the provision of ecosystem services and the resilience of coupled human-natural systems (Kibler et al. 2018). For the past decade, countries, organisations (public and private) and communities have made pledges to restore millions of hectares of degraded lands (Fagan et al. 2020). For example, the Bonn Challenge to restore 350 million hectares of forests and lands by 2030 that includes the AFRICA100 initiative (Dave et al. 2019) and the New York Declaration on the forest to restore 350 hectares of degraded forests by 2030 (Stanturf et al. 2017). There is a need to support the transformation of these figures into action, through concrete long-term restoration investments on the ground.

The improvement of the ecological functions of land can be achieved through natural regeneration (with human support and farmer management), tree-growing (with dependence on seed supply and other inputs), including soil and water conservation techniques (van Noordwijk et al. 2020). Whatever the type of restoration approach, the decision-making process that drive actions, determine restoration objectives, expected benefits, motivations, preferences, and restrictions depends on the behaviour of restoration stakeholders (such as farmers, community-based organisations, local NGOs, and councils) (Jalonen et al. 2018). Getting stakeholders to involve is relevant for the success of restoration initiatives. The involvement of stakeholders in restoration actions in the short and long term depends on a mix of factors that are socioeconomic, cultural and institutional in nature, originating from the internal and external environment of the stakeholders (Chirwa and Mahamane 2017; Fox and Cundill 2018; Walters et al. 2021).

Support programs, for example through the provision of incentives have been used for promoting stakeholder involvement in restoration actions (Wainaina et al. 2021). It is argued that incentives will help restore and conserve the ecological integrity within the environmental and institutional framework that account for benefits and costs related to the restoration of degraded ecosystems (Bryan 2013; Guerry et al. 2015). According to Casey et al. (2006):18 support through incentives is *"anything that can motivate an agent to take a particular course of action or any policy, program, institution or economic instrument that motivates conservation and management of forest ecosystems"*. The distribution of incentives to beneficiaries can take so many forms for example incentives may include monetary (cash), non-monetary (technical assistance, tax credits), and non-financial (Minang 2018). In Cameroon and many other developing countries, governments, non-governmental organisations, agencies, financial and technical partners have invested large sums of money on voluntary land restoration incentive support programs. However, due to decreasing funding opportunities to cover the large demand for support, access has been submitted to a competitive application process. In these processes, evaluation is sometimes based on biophysical and ecological variables (for example, surface area and type of species) with limited consideration of social outcomes (for example, the durability of the behavioural change of the beneficiary and beneficiary conservation stewardship attitude change) (Race and Curtis 2013; Dayer et al. 2018).

Stakeholders' adoption of tree-growing practices for restoration and participation in voluntary support programs have been studied (Wainaina et al. 2021; Djenotin, et al. 2018; Höhl, et al. 2020). However, research on the reasons why stakeholders will continue in restoration practices after restoration support programs end is poorly represented in forest and land restoration literature. Not enough research has done empirical investigation on why restoration agents continue their restoration behaviour when support programs stop (Swann 2016). Researchers signify this as a serious concern given that most conservation successes and benefits depend on sustained behavioural change (Reimer et al. 2014; Gatto et al. 2019; Defrancesco et al. 2022). The behaviour changes or sustained behaviour that is expected is termed "persistence" as it is a continuation of a course of action or behaviour (Dayer et al. 2018). The concept of persistence has been used to study the post program behaviour of beneficiaries in support programs in the energy (Frey and Rogers 2014) and agriculture sectors (Dunn et al. 2016). The reverse behaviour when a beneficiary returns to a pre-program situation is termed "disadoption" (Claassen and Ribaudo 2016) or "reversion" (Kuhfuss et al. 2016). In conservation and restoration literature, what remains less known is why persistence or reversion? (Dayer et al. 2018; Gatto et al. 2019). This study is expected to contribute to fill this gap by using the tree-growing restoration experiences in the Sudano-Sahelian region of Cameroon as a case study.

Cameroon has made commitments to restore 12 million hectares of degraded lands under the AFRICA100 initiative (MINFOF-MINEPDED 2020). The government and its technical and development partners have been providing support to entities involved in tree-growing through support programs and projects. However, with the dwindling financial resources, programs will not be able to cover the increasing demand for long-term support from tree growers, thus, there is a need to re-strategize and focus on supporting initiatives that will be sustainable and deliver the expected restoration impacts. Financial resources are to be invested in programs to incentivise tree-growing for restoration purposes. An empirical examination of the tree-growing behavioural persistence is needed to shape the design and effective implementation of tree-growing support programs and policies.

The behavioural persistence in the context of tree-growing support programs is examined through the following research questions: (1) How is behavioural persistence condition considered in the design and implementation of tree-growing support programs? (2) Why do beneficiaries continue their tree-growing practices after support programs end? Concerning the first research question, the paper examined the procedural aspects of tree-growing support programs to check if behavioural persistence and/or sustainability requirements are part of the selection criteria or participation requirements. This includes the level of awareness of beneficiaries on the lifespan of subvention programs and post program continuation. The second research question focused on the beneficiaries of support programs to examine why they continued tree-growing restoration practices after the end of support programs.

The information generated from this analysis, will contribute to the operationalisation of the forest landscape restoration strategy and to enhance understanding in the restoration movement in Cameroon, where a diverse set of stakeholder groups are involved - policy makers, development partners, practitioners, CSOs, and communities. The study will further contribute to the literature on restoration especially

on the human and social dimensions of restoration, currently being dominated by the literature on the ecological dimensions (Chazdon et al. 2017). In the following section, the analytical framework is presented, followed by the methodology. The results and discussion sections follow. The paper ends with a conclusion section.

Analytical Framework

The framework for this study is informed by the concept of behaviour persistence and the literature on landowner behaviour. Understanding the social mechanisms underlying persistence results is important to fully appreciate, predict, and influence persistence likelihoods. Social science-based explanations are better placed to help us understand why a particular behaviour may or may not last beyond the life of a support program (Dayer et al. 2018). Dayer et al. (2018) proposed five pathways by which the behaviour of land users could be expected to last or revert when support programs end. They include:

Land Users' Attitude and Perception

This relates to the fact that attitude towards a specific practice and the perception of an individual's ability to perform a behaviour can influence the adoption of practices in the long term. Dayer et al. (2018) noted that if the participation in support programs generate positive change in the land users' attitude, then persistence outcomes will be more likely to endure after support programs end. It is further underscored that positive (or negative) outcomes of a support program can influence land users' attitude towards proposed practices and increase (or decrease) behaviour persistence (Dayer et al. 2018).

In terms of perception of behavioural control, farmers with a greater sense of control over the adoption of a practice, are more likely to adopt these practices. Perception of behavioural control is also very important after incentive programs (Dayer et al. 2018). In this case persistence outcomes could be facilitated after a support program ends when farmers feel more in control and capable of implementing a practice (Hayes 2012).

Habit Forming

Habits have been proposed in the health and household energy conservation research programs as another important factor that could influence persistence outcomes (Frey and Rogers 2014). Frey and Rogers (2014) define habits as an automated tendency to repeat a specific behavioural response and indicates that behaviours that are repeated frequently in the same environmental context are better suited for habit formation. An individual past behaviour is a common determinant for habit strength (Dayer et al. 2018).

Resources

Farmers and other types of land users may require resources such as time, labour, capital equipment to continue conservation behaviour following the end of support programs (Dayer et al. 2018). According to Kwasnicka et al. (2016), land users with sufficient resources will be more likely to show behavioural persistence following the end of a support program. Financial cost and benefits of conservation practices is an important factor in decision- making (Kuhfuss et al. 2016; Dunn et al. 2016). Based on this relationship, it can be noted that land users below a certain and unknown level of financial resources will not be able to continue practices after a support program ends. Furthermore, practices that are profitable to a land user are very suited for continuation (Dayer et al. 2018).

Social Influence

Decisions concerning land use are made in social contexts that may or may not support persistence of conservation practices (Dayer et al. 2018). A land users decision-making may be influenced by the beliefs of what other land users are doing (descriptive norms) and what behaviours are socially acceptable (injunctive norms) (Fishbein and Ajzen 2010). These two norms are part of the community and culture in which a land user is located and operating (Dayer et al. 2018).

Sustaining Motivations

Farmers are driven by different motivations to involve in practices under natural resource management support programs. Farmers whose motivations endure beyond program end, are likely to demonstrate persistence behaviour post support program (Kwasnicka et al. 2016; De Snoo et al. 2013). Motivations can be extrinsic (financial incentives, recreation opportunities) or intrinsic (internal satisfaction – food security, income). It is argued that intrinsic motivations are more durable and more likely to results to persistence conditions (Kwasnicka et al. 2016).

The study will draw on the pathways (Table 1) described above to investigate why tree growers in the context of restoration will continue their activities after support programs end.

Methodology

Study Area

This study is based partly on a survey conducted between October and November 2021 in the Mogazang landscape located in the Far North region which is part of the Sudano-Sahelian agroecological zone in Cameroon. The Sudano-Sahelian agroecological zone is a priority area for restoration in Cameroon and constitutes a greater proportion of the 12 million hectares national restoration commitments (MIFOF-MINEPDED 2020). The villages that the farmers were interviewed from, share

Table 1 Persistence behaviour pathways and factors that drive persistence behaviour in tree growers

Persistence behaviour pathways	Factors that drive persistence behaviour in tree growers
Land users' attitude and perception	-Tree-growing practices that show success during support program - Adequate control over tree-growing practice i.e., become easier to conduct over time
Sustaining motivations	- Internal and external benefits of tree-growing i.e., compatible with tree growers' motivations, needs, and goals for their land
Habit forming	- Tree-growing habit (for example growing trees before the subvention program)
Resources	- Availability of resources (time, knowledge, labour) - Financial profitability of tree-growing
Social influence	- Influence from the behaviour of other tree growers - Tree growing is cultural or socially accepted in the community

similar biophysical and socioeconomic characteristics. The area has an undulating topography comprised of flood plains and mountainous areas that favour soil erosion and land degradation. The climate is tropical, of the warm Sudano-Sahelian type with two seasons. A long dry season (8 months) and a short rainy season (June to September). The region experiences an average annual temperature of about 28.25 °C and fluctuates around 19 °C in the cool season and 38 °C in the hot season (ONACC 2018). Rainfall varies between 500 and 1,200 mm per year, and rainfall records of the last decades showed a drastic decrease (ONACC 2018).

Socio-economic activities are very diversified in the landscape. Agriculture is the main economic activity based on the production of food crops (rainy season sorghum, off-season sorghum, peanuts, sesame, and cowpeas), cash crops (onions, maize, cotton), tubers (potatoes, cassava), as well as a few fruit trees (mangoes, guavas, lemon, cashew nuts). Average yields are around 1000 kg/ha for cereals, 800 kg/ha for legumes, 1200 kg/ha for tubers particularly potatoes. Livestock rearing is also a key activity in the landscape, for example cattle, sheep, goats, poultry, and pigs. Land users in the area have different levels of resource endowments and socio-economic characteristics that potentially shape their land use decision making and practices (M2C 2016).

Forest land in the region is a mix of vegetation formations that meet the FAO definition of a forest that indicates forest to be land spanning more than 0.5 hectares with trees higher than 5 m and a canopy cover of more than 10% (FAO 2018). These vegetation formations are, in order of decreasing tree density, forest plantation, tree savannah, shrub savannah, grassy savannah, tree steppe, shrub steppe and grassy steppe (M2C 2016).

Agricultural land consists of orchards, agroforestry parks and cultivated fields with low tree density. Bare soil, rocky outcrops, housing, road infrastructure, and the river system were classified as other land types (MINFOF-MINEPDED 2020).

Data Collection

Primary Data

The study design was cross-sectional, descriptive, and co-relational. The study targeted farmers in the Mogazang landscape that benefited from tree-growing support

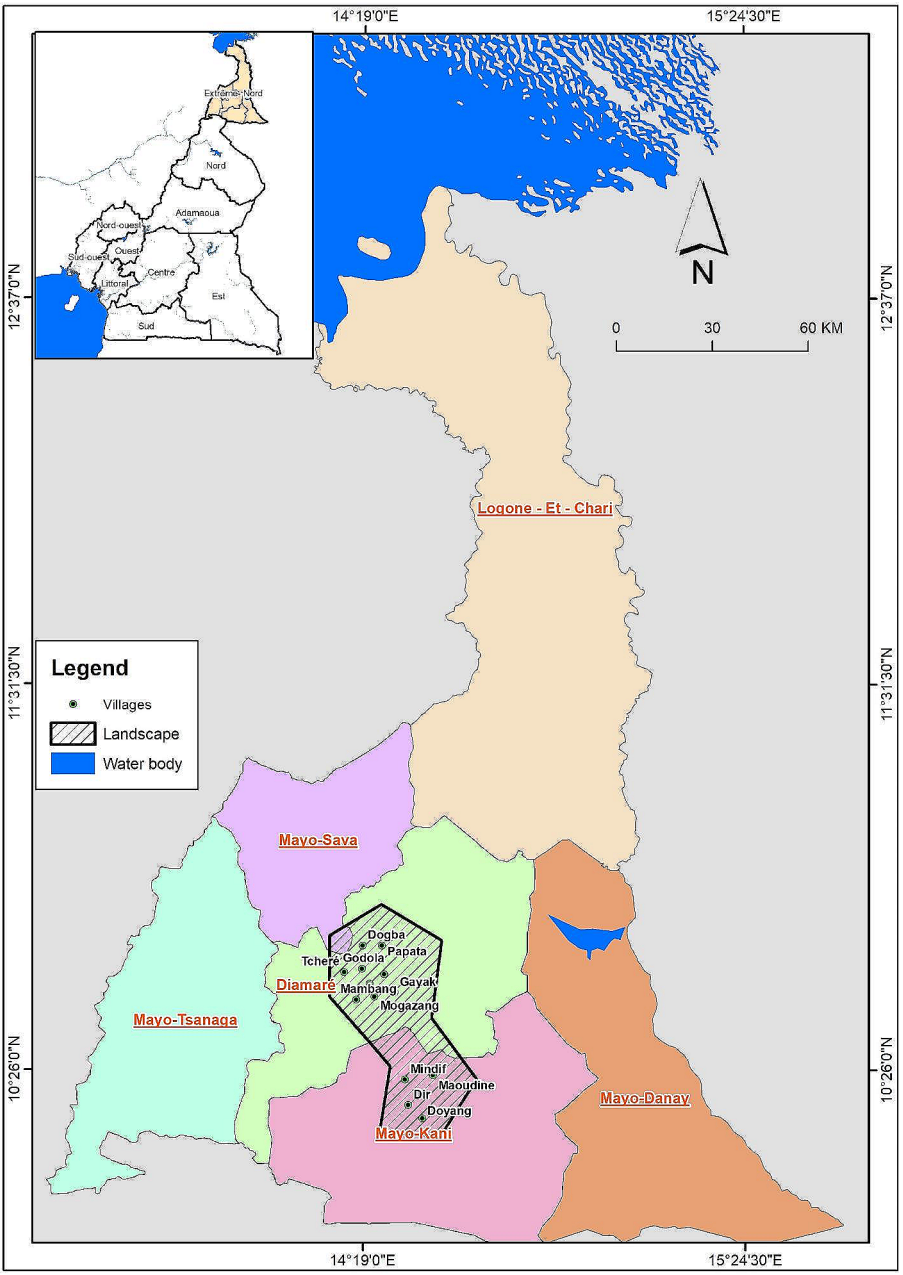

Fig. 1 Map of the Far North region of Cameroon showing the Mogazang landscape and the study villages

programs. To this regard, a purposive sampling technique was used to select the targeted farmers where 157 farmers were selected following program reports from the landscape. Farmers' participation in support programs and their availability during the data collection period served as the key criteria for inclusion in the list of farmers that were interviewed using a semi-structured questionnaire to elicit information relevant to the study objectives. Prior to data collection, the questionnaire was pretested to ensure consistency, reliability, and validity of the instrument. Data numerators were recruited and trained before carrying out the survey. Seven key informant interviews were also carried out with past support program project managers and field assistants.

Secondary Data

The requirements and process for applying and benefiting from tree-growing support programs in the case study area were examined to understand if beneficiaries were prepared psychologically about the short-lived nature of support programs and the need for them to continue their tree-growing practices after the end of support programs. The program documents of three support programs provided the bases for the assessment. This included the support program of the German Technical Cooperation (GIZ), the support programs of the Ministry of Forestry and Wildlife and the Ministry of Environment, Nature Protection and Sustainable Development.

Data Analysis

Descriptive statistics and correlation analysis were applied to analyse the primary data using Excel and the Statistical Package for Social Scientists (SPSS V21). The descriptive statistics that included frequencies and percentages were used to understand trends in the responses across the different factors that drive farmers behavioural persistence regarding tree-growing. The Spearman's correlation analysis was used to understand the relationship, first, between the farmers characteristics and the factors that drive farmers behavioural persistence regarding tree growing and second, among different factors that drive farmers behavioural persistence regarding tree-growing. The Spearman's rank correlation coefficient assesses how well the relationship between two variables can be described using a monotonic function. The Spearman's correlation was used because the dataset was not normally distributed following the test of normality ran with Kolmogorov-Smirnov test.

Results

The results are presented in two sections. First, on whether preparations of tree growers for continuation after the end of support programs are taken into consideration during program design and inception, and second, the factors that caused farmers to continue their tree growing activities after support programs. For each of the factors that is assumed to influence the behavioural persistence of tree-growing farmers, the results of the frequency analysis are presented, followed by the results of the correla-

tion analysis between the socioeconomic characteristics of farmers and the factors that drive behavioural persistence, and the results of the correlation analysis among the factors that drive behavioural persistence in tree growing farmers.

Preparing Tree Growing Farmers for Continuation after Tree-Growing Support Programs

The project documents of the support programs do not indicate any clear approach, requirement, or activity to communicate, raise awareness and sensitise tree-growing farmers about the need to take responsibility and continue in tree-growing after support program ends. These are key issues that were supposed to be part of the inception phase of the programs. Little effort was made to present the facts to farmers, that tree growing is a lengthy process that requires both short and long-term investments, and that the long-term investments will be the farmers' responsibility after a support program. Programs focused mostly on short-term investment needs when presenting and engaging with farmers and stakeholders in tree-growing activities. Some projects saw the idea of presenting the potential challenges and needs of tree-growing after the end of support programs as a factor that will create a disincentive environment for farmers to engage during the implementation period of the tree-growing support program. Thus, some programs were seen as focusing on achieving their objectives as a program, rather than tree-growing as the overall objective.

> Some organisations don't communicate much on the short-term nature of support programs and the long-term implication of farmers because of fear that communities or beneficiaries will not develop interest in the implementation of activities, a key informant commented.

Factors that can drive behavioural persistence among tree growers were not taken into consideration as part of the requirements of tree growing support programs. These programs are termed "tree growing" programs, but in practice, they are "tree planting" programs. This situation is worse with the government-supported schemes where support is sporadic with little or no assurance of whether support will be available or not, the following year. Little or no clear guidance was provided to beneficiaries in terms of planning interventions, even though it is known that the government do not have the capacity to fully fund tree growing schemes. Furthermore, in the government support programs support activities were evaluated on the number of trees planted as opposed to the number of trees grown. This is an indication that tree growing behavioural persistence is not considered in the design of the programs, since tree growing necessitates continuation in managing trees to maturity after planting.

Drivers of Farmers Tree-Growing Persistence Behaviour

Among the farmers interviewed, about 46% had no formal education while the rest had attained primary and/or secondary education levels. About 94% of the respondents were male farmers and farm sizes were dominated by plots of less than one hectare. The farmers were involved in agroforestry and monoculture tree land use

practices (considered here as plantation), though the agroforestry practices dominated land use activities involving about 62% of interviewed farmers.

Tree Growers' Attitude and Perception

The attitude and perception of tree growers in relation to their behavioural persistence is influenced by the fact that activities implemented during the support program period were successful and farmers had the appropriate knowledge and sufficient technical capacity to continue. About 82% farmers indicated that they continued tree growing due to the successes they observed during the support program period. While about 72% of the interviewed farmers specified that they were motivated to continue tree-growing as a farm practice because they had adequate control over tree growing practice i.e., tree growing tasks became easy to handle over time. There was no significant relationship between the level of education, gender, farm size and tree growers' attitude and perception (Table 2). The results showed a positive significant correlation ($P<0.05$) between type of tree planting practice and farmers attitude and perception towards tree growing, especially attitude and perception influenced by the success stories of the support program. Agroforestry farmers were more influenced by the success stories of the support program to continue tree-growing practice on their farms.

The results showed a positive significant correlation ($P<0.01$), between farmers attitudes, influenced by success stories and farmers attitudes influenced by acquired capacity and knowledge (Table 3). Similarly, farmers attitudes influenced by appropriate capacity and knowledge of farmers showed a positive significant correlation ($P<0.01$), with farmers sustain motivation resulting from the internal and external benefits of tree planting. The capacity and knowledge of farmers to manage tree planting was highly correlated ($P<0.01$), with the tree planting habit of farmers, where famers have been involved in tree growing before the support program. There was a negative significant correlation ($P<0.05$) between the capacity and knowledge of farmers to manage tree planting and farmers resources (time, labour, and knowledge for example). Lastly, none of the factors that influenced farmers attitudes and perception to continue tree growing were correlated with the social context factors i.e., tree- growing as a cultural and social norm and the tree growing behaviour of other farmers (Table 3).

Motivation of Tree Growers

About 72% of the interviewed farmers indicated that the expected benefits from tree-growing contributed to their decision to continue to grow trees after the end of support programs. Motivation originates from the internal and external benefits of tree growing i.e., compatible with the farmer's motivations, needs and objectives. The results of the correlation analysis showed no significant association between the farmers motivation and the farmers socioeconomic characteristics such as level of education, gender, farm size and type of tree- growing practice (Table 2).

There was no significant correlation with the other drivers of the behavioural persistence of tree growers such as the tree planting habit of farmers, availability of

resources for farmers to continue tree growing, influence from the behaviour of other farmers and tree-growing culture of the community (Table 3). However, the results showered a positive significant correlation ($P<0.05$) between the motivation of farmers to continue tree-growing and the financial profitability of tree-growing (Table 3).

Tree-Growing Habits of Tree Growers

About 73% of the interviewed farmers identified themselves with the fact that tree-growing was part of their farming habits before the arrival of support programs. The correlation analysis results between the tree-growing habits of tree growers and the farmers socioeconomic characteristics such as level of education, gender, farm size and type of tree- growing practice, showed no significance (Table 2).

The results showed a positive significant correlation ($P<0.05$) between the tree-growing habits of tree growers and the availability of resources for tree-growing in terms of capacity of farmers to mobilise personal resources in relation to material inputs, time, labour. Similarly, there was a positive significant correlation between the tree growing habits of tree growers and the influence of the behaviour of other farmers planting trees (Table 3). On the other hand, there were no significant correlation between the tree-growing habits of tree growers and other behavioural persistence factors such as availability of resources for tree- growing and tree growing as a cultural norm in the community (Table 3).

Resource Capacity of Tree Growers

Only 43% of the interviewed farmers identified their personal resource capacity as a factor that influenced their decision to continue tree-growing after support programs. On the other hand, about 83% of the interviewed farmers indicated that the financial profitability of tree cultivation contributed to their decision to continue tree-growing. The correlation analysis results between the resource capacity of tree growers (i.e., availability of financial resources and financial profitability of tree growing) and the farmers socioeconomic characteristics such as level of education, gender, farm size and type of tree-growing practice, showed no significant correlation (Table 2).

The results showed a positive significant correlation ($P<0.01$) between the availability of resources to continue tree-growing and the continuation of tree growing, influenced by tree growing as a community norm. On the other hand, there were no significant correlation between the availability of resources for tree growers and the other behavioural persistence factors such as financial profitability of tree cultivation and the influence of the behaviour of other farmers planting trees (Table 3).

Social Context of Tree Growers

The social context of tree growers influences the behaviour of farmers in two ways. First, they were influenced by the tree planting behaviour of individual farmers, and second by the fact that tree planting was a social norm in the community. About 50% and 72% of the interviewed farmers mentioned that they were influenced by the behaviour of individual farmers and tree growing culture in the community. For

Table 2 Relationship between farmers characteristics and the factors that drive farmers tree growing behavioural persistence

Farmers Characteristics	STP	AKC	MTG	TGH	RCT	PTG	TGB	TCN
Level of Education	0.027	-0.033	0.057	-0.061	0.107	0.033	0.034	-0.093
	P=0.740	*P*=0.686	*P*=0.493	*P*=0.458	*P*=0.192	*P*=0.686	*P*=0.677	*P*=0.257
Gender	0.047	0.049	-0.017	0.057	-0.077	0.118	0.118	-0.149
	P=0.573	*P*=0.550	*P*=0.838	*P*=0.488	*P*=0.348	*P*=0.151	*P*=0.151	*P*=0.069
Farm size	-0.002	0.104	0.063	0.035	-0.088	-0.143	0.059	0.063
	P=0.981	*P*=0.207	*P*=0.448	*P*=0.675	*P*=0.289	*P*=0.082	*P*=0.478	*P*=0.448
Type of tree planting practice	0.244**	-0.130	0.159	0.050	-0.003	0.075	0.009	0.058
	P=0.003	*P*=0.117	*P*=0.055	*P*=0.546	*P*=0.967	*P*=0.370	*P*=0.913	*P*=0.483

**. Correlation is significant at the 0.01 level: *. Correlation is significant at the 0.05 level. STP - Successful tree growing practices; AKC - Appropriate knowledge and capacity; MTG - Motivation of tree growers; TGH - Tree growing habit; RCT - Resources capacity of tree growers; PTG - Profitability of tree growing; TGB - Tree growing Behaviour of other farmers; TCN Tree growing as a cultural norm

Table 3 Relationship among the factors that drive farmers tree growing behavioural persistence

	STP	AKC	MTG	TGH	RCT	PTG	TGB	TCN
STP	1.000	0.270**	0.143	0.159	0.073	-0.080	0.071	-0.024
		P=0.001	*P*=0.084	*P*=0.054	*P*=0.377	*P*=0.332	*P*=0.391	*P*=0.768
AKC		1.000	-0.271**	0.260**	-0.166*	-0.110	0.124	-0.028
			P=0.001	*P*=0.001	*P*=0.043	*P*=0.180	*P*=0.133	*0.736*
MTG			1.000	-0.058	-0.073	-0.187*	0.085	0.094
				P=0.482	*P*=0.374	*P*=0.022	*P*=0.301	*P*=0.254
TGH				1.000	-0,197*	-0.152	0.216**	0.159
					P=0.016	*P*=0.064	*P*=0.008	*P*=0.053
RCT					1.000	-0.002	-0.020	-0.256**
						P=0.977	*P*=0.812	*P*=0.002
PTG						1.000	-0.154	-0.061
							P=0.061	*P*=0.461
TGB							1.000	0.124
								P=0.133
TCN								1.000

**. Correlation is significant at the 0.01 level: *. Correlation is significant at the 0.05 level. STP - Successful tree growing practices; AKC - Appropriate knowledge and capacity; MTG - Motivation of tree growers; TGH - Tree growing habit; RCT - Resources capacity of tree growers; PTG - Profitability of tree growing; TGB - Tree growing Behaviour of other farmers; TCN Tree growing as a cultural norm

many decades, tree planting to fight harsh climatic conditions have been part of the land use practice for communities in the landscape. The correlation analysis between these two social factors showed no significant relationship (Table 3). Even though, tree planting was considered a common land use practice in the communities, the decision to plant and retain trees on farms is influenced by a combination of factors that depend on individual farmers choices.

Discussion

The results showed that tree growing support programs do not make sufficient contribution to enhance the behavioural persistence of tree-growing farmers in the Mogazang landscape. Support programs, especially government programs are planned on the premise of "tree planting" as opposed to 'tree growing" which is a lengthy process. According to Duguma et al. (2020), tree-growing demonstrates the capacity of planted trees being able to survive with the ability to contribute to the objectives they were planted. The long-term necessities of tree-growing are not taken into consideration during the planning phase of interventions; thus farmers are not prepared in terms of continuation after support program ends. Communication and providing information are key in building persistent and behaviour-driven attitudes (Pierro et al. 2012). The results showed that support programs do not have strong communication and sensitisation strategies in place to prepare farmers on the need to take responsibility over tree- growing activities after programs end. Asensio and Delmas (2016) reported that developing and implementing effective information and communication strategies is important in shaping long-term conservation behaviour. Thus, to contribute to ensure and sustain continuation after tree-growing support programs, there is a need for tree-growing support programs to develop and implement effective information, education, and communication strategies.

The results showed that farmers attitude and perception is crucial in determining the behavioural persistence of tree-growing farmers in the Mogazang landscape. The perception of successes in tree-growing practices appeared to be a driving factor for farmers to continue in their tree-growing practice after support programs. This finding corroborates with the findings of other studies. In Australia for example, Race and Curtis (2013) found that farmers were more likely to continue implementing natural resource management practices they perceived to be successful. Also, in France, farmers that perceived a higher quality of life during participation in a support program were more likely to state their intentions to continue with conservation behaviours after the end of support programs (Kuhfuss et al. 2016). The results related to attitude and perception, further showed that the farmers in the Mogazang landscape continued to implement tree-growing practices on their farms because farmers had the capacity to comfortably respond to the technical needs of integrating and managing trees on their farmlands. In Kenya, Oeba et al. (2012) found that technical capacity of farmers on silvicultural practices was an enabling factor for farmers to continue to retain trees on their farms. Mellon Bedi et al. (2022) mentioned following their study in Ghana that the provision of support services, for example through extension services is important for farmers learning improvement. This is related to the results of Oeba et al. (2012) which indicated that extension services had a positive significant correlation with the technical capacity of farmers that retain trees on their farms. The positive significant correlation between farmers attitudes, influenced by success stories and farmers attitudes influenced by acquired capacity and knowledge implies that farmers were able to acquire sufficient knowledge and skills during the support programs. This indicates the importance of extension services in supporting farmers in terms of training and ensuring that experimental tree-growing practices undertaken with farmers succeed during the support program period. Furthermore,

the positive significant correlation between farmers attitudes influenced by farmers capacity and knowledge and farmers sustain motivation to continue tree-growing, suggests the importance of ensuring that farmers acquire sufficient technical capacity during support programs. In this regard efforts must be made to use appropriate training techniques that will enable farmers to learn, and use acquired skills in their farm practices. And the more farmers are involved in tree-growing as a farming practice, the higher their technical capacity will increase. This is shown by the positive significant correlation results between the capacity and knowledge of farmers to manage tree-growing and the tree-growing habits.

The results showed that farmers capacity to stay motivated, contributed to their decision to continue to grow trees. Motivation in this case was internal i.e., the financial and livelihood related benefits that farmers expected from tree-growing. The positive significant correlation between farmers motivation and financial profitability implies that the more farmers perceive financial benefit flows from their tree-growing investments, the more they stay motivated to carry on with their tree-growing practice. This concurs with a study carried out on the determinants of farmers tree retention capacity in Kenya which showed that farmers motivation was driven by the different benefits they got from trees on their farms. This contributed to tree retention after the support program (Oeba et al. 2012). Another study on the restoration of degraded semi-arid land in Kenya, reported that the motivation of livestock farmers to continue to implement improved land use practices was driven by income and other related benefit flows (Mureithi et al. 2016).

Results of the analysis showed that tree growing habits of the interviewed farmers in the Mogazang landscape influenced their tree-growing behavioural persistence. Farmers indicated that tree-growing have been part and parcel of their land use practice before support programs. Habits have been seen to be pertinent for influencing environmental behaviours such as waste management behaviour and energy conservation behaviour (Klöckner 2013). Findings from a study in Nebraska, United States of America showed that land users who had implemented conservation tillage practices in the past were more likely to adopt the behaviour again and stressed that habits were responsible for this outcome (Sheeder and Lynne 2011).

The positive significant correlation between habit formation and capacity of farmers to mobilise resources (time, labour for example) to carter for tree-growing, implies that farmers consider tree-growing as part of their land use practice. Thus, minimum resources are always allocated for tree-growing. Furthermore, the positive significant correlation between the tree- growing habits of the farmers and the influence of the behaviour of other farmers growing trees, indicates that farmer-to-farmer networking or relationship is important to strengthen farmers tree-growing behavioural persistence.

The results showed that farmers continued tree-growing after the support program, because they perceived tree-growing as a profitable practice. This is in line with the study of Kuhfuss et al. (2016), which indicated that farmers persistence intentions were high when their farm practices were able to generate better sale value for farm products.

Tree-growing as common practice or norm in the communities played an important role to drive farmers to continue tree-growing. Information about other land

user's persistence behaviours affects the intention to persist of other farmers following a support program. Moreover, land users who perceived the social acceptance of their conservation behaviours are more likely to state their intentions to continue after a program ends (Kuhfuss et al. 2016). In studies on the determinants of farmers choices to remain or abandon agri-environmental schemes in Italy, results showed that the influence of other farmers, social pressure, described as neighbourhood effect increased the probability of farmers to remain as part of the schemes (Defrancesco et al. 2008; Gatto et al. 2019).

Conclusion

This study aimed primarily to analyse the factors that drive the behavioural persistence of tree-growing farmers following the end of tree-growing support programs. First, the study examined whether during the inception phase of support programs, farmers are well informed and drilled on their responsibility to continue tree-growing post support programs. Second, the study analysed the role played by farmer related characteristics to influence their decisions to continue tree-growing after the end of support programs.

The results have shown that during the inception phase of the support programs, insufficient effort was made to ensure continuation after the support programs. Emphasis was made on achieving the objectives of "tree planting" as opposed to "tree-growing" that requires planted trees to survive with the capacity to contribute to the objectives they were planted.

The results also indicated that the positive attitude and perception of farmers, constant motivation, financial profitability, influence from other tree growers and community are all factors that influence farmers decision to continue in tree-growing after support programs end. These were factors that are directly related to farmers characteristics, and they need to be assessed during the design, inception and implementation of tree-growing support programs. With these factors taken into consideration and enhanced, there are high chances that tree- growing will experience continuation after the end of support programs.

By focusing the attention on the continuation rather than the beginning of tree-growing, this study has enriched a still growing body of literature and offered a contribution to a topic that deserves more attention given the importance of tree-growing in the land and forest restoration agenda globally and in Cameroon in particular. Furthermore, the inquiry from tree-growing support programs activity areas in the Sudano-Sahelian region of Cameroon has generated information that will contribute to understand factors that are important to drive long-term involvement and success in restoration activities at scale in Cameroon.

Despite these interesting results that are relevant for designing and implementing tree-growing support programs, the study has some limitations that could serve as an opportunity for further research. First, the study did not consider the time-dynamic perspective of farmers decision to continue to grow trees that can shift over time, adapting to the changing social context where farmers values can be modified and negotiated by social interactions. Thus, undertaken a study on farmers tree-growing

behavioural persistence after a long period of time following the end of a support program, can produce interesting results since time-dynamics have implications on policy design on the one hand, and on the other hand, changes in policy and social context can also influence farmers decision making in the long-term. Second, the study is limited to a specific geographical setting. This specificity was important since landscape driven policies can be well understood following a placed based perspective.

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Declarations

Ethical Approval The study was conducted according to the guidelines of the Declaration of the University of Pretoria and approved by the Faculty of Natural and Agricultural Sciences Ethics Committee (Reference number: NAS190/2021 and date of approval; 8 September 2021).

Consent for Publication Not applicable.

Competing Interests The authors declare no competing interests.

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