THE PARADOX OF THE POPULARITY OF TREE PLANTING INTERVENTIONS IN RWANDA: A CALL FOR THE INTEGRATION OF INDIGENOUS AGROFORESTRY

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The paradox of the popularity of tree planting interventions in Rwanda: a call for the integration of indigenous agroforestry

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Cover photo: This photograph was made during a visit on the 14th of December2022) to a traditional healer (*umuvuzi gakondo in Kinyarwanda*) and his family in Kinigi. Kinigi is located near the border of Volcanoes National Park. The traditional healer explained us how his mother (in the photograph) passed on her knowledge to her son and daughter, who are often consulted by community members for their knowledge on traditional medicine. The mother, sister and the traditional healer himself showed us around in the garden rich of indigenous and exotic species, whilst proudly sharing which species serve what medical purposes.

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ABSTRACT

This study dives into agroforestry practices in Rwanda and the role of indigenous knowledge in the increasingly popular tree planting interventions. Accordingly, this study looks at the implications of the rapid growth of these interventions on the existence of indigenous knowledge and activities. Whereas previous research on agroforestry in Rwanda focused on behaviour change theories, this study approaches this subject with a social practice lens. In a three month field visit, thirteen semi-structured interviews, three focus groups and participant observation were conducted. As a result from the case-study analysis, a distinction is made between indigenous agroforestry practice and interventionist agroforestry practice. This distinction is based on how these two practices differ in elements of meaning, material and competences. What arises from this is that agroforestry is a contested practice embedded in contrasting worldviews. Exogenously introduced tree planting interventions, often embedded in a Western worldview, tend to focus on the 'knowledge-gap' amongst local communities regarding agroforestry. In appointing this knowledge gap to local communities who rely on farming, (non)governmental organisations legitimise the introduction of 'modern' technologies that better align with the pursuit of national (and global) economic development. The findings of this study indicate that in tree planting interventions in Rwanda, there is often little or no attention for assumably less profitable indigenous values and activities. This is worrisome for both the existence of indigenous knowledge and activities and for biodiversity.

Key words: agroforestry, exogenous development, indigenous worldviews, social practice theory, tree planting interventions

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Murakoze cyane

Thanks a lot

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Not only the 100WEEKS team welcomed me in Musanze. Without the in-depth and sometimes sensitive conversations and support of my Rwandan roommates and friends, it would have been much harder to get the smallest grasp of Rwanda's rich culture. Them sharing their day-to-day experiences with me has been of inestimable value both on a social and academic level.

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TABLE OF CONTENTS

List of tables & figures

1. INTRODUCTION

Rwanda is commonly associated with the atrocities of the 1994 genocide. Thereafter, Rwanda had to be rebuilt from scratch. With foreign support, the Rwandan government under the leadership of Paul Kagame, succeeded to develop Rwanda into a (compared to neighbouring countries) relatively stable and wealthy country. Besides enormous economic, social and political developments, the Rwandan government regards sustainability as a key driver for development. The ban of non-biodegradable plastic bags and packages, monthly (mandatory) national community clean-up days, the establishment of the 'Green Fund' and the far-reaching reforestation efforts are just some of the measures initiated by the Rwandan government. These efforts contribute to the image of Rwanda as 'the Switzerland of Africa' and attract foreign investors.

Undoubtedly, the catastrophic genocide has had severe consequences for the impoverishment of a large share of the Rwandan population, targeting especially women. The remarkable efforts of the government regarding the stabilisation and recovery of the country led to a significant increase of Rwanda's GDP as well as a decline of the amount of people living below the poverty line (Worldbank, 2020). Even though these prospects may sound positive for the country, the effects of these developments are not evenly tangible for all Rwandan people. The economic growth of the country leads to an increasing demand in land. It is generally, however, not the members of local communities that can make land claims. Consequently, the political and economic situation of these communities becomes less secure. At the same time, environmental challenges are threatening the livelihoods and food security situations of Rwandan communities who rely on natural resources. There is a tendency in development interventions to focus on how the anti-environmental 'behaviours' of local communities are threatening the environment and thus in need of correction. To illustrate this, amongst the most often recognised drivers behind deforestation and forest degradation are subsistence farming and the extraction of products from forests (Kiyani et al., 2017; MINILAF, 2017). 83% of the Rwandan population uses firewood as main cooking fuel which, according to the Ministry of Land and Forestry (2017) stimulates illegal cutting activities. From this starting point, national (and international) policies target communities with reforestation interventions. Is it, however, justifiable to burden communities with such interventions demanding communities to change their livelihood in the light of (national) economic development?

Climatic threats such as deforestation, droughts and floods are catastrophic for Rwandan farming households. Yet, the consequences of such events co-exist with economic developments, e.g. the growth of intensive agriculture which relies on external inputs that, in turn, are harmful or detrimental to the environment (Taremwa et al., 2016). The influence of this on food security, water, energy and healthcare function as barriers for the medium and long-term development policies (i.e. Economic Development and Poverty Reduction Strategy and Vision 2050) that are established by the government for amongst others reducing poverty and environmental degradation (Taremwa et al., 2016). With these strategic policies, the government aims to engage local communities in these policies as they are said to have limited awareness, whereas in fact they are being restrictedly involved and consulted in the planning and management of forest resources. In other words, fingers are repeatedly pointed to communities who in reality are being marginalised, because their activities do not fit the dominant economic model of (non)governmental organisations. Moreover, in these development policies there is often no room for indigenous activities (e.g. traditional medicine) that are crucial for Rwandan communities but are not in line with purposes of economic development. Hence, the accelerating pace in which Rwanda's economy develops risks leading to the further marginalisation of local communities' worldview, knowledge and activities. In this study, this broader dynamic will be applied to the field of agroforestry.

It is not only the government, but also non-governmental organisations (NGOs) that have an interest in being involved in encountering these 'deforestation' activities. Through their tree planting

interventions, NGOs are trying to help bring the anti-environmental activities of communities (e.g. illegal cutting activities) to an end. Considering the slow growing rates of trees and the limited amount of land available, planting large scale forests is not a favourable (nor a profitable) option for the Rwandan government or other organisations involved. Accordingly, the alternative offered by both NGOs and the government is agroforestry also fitting trends of 'reforestation' and 'regreening'. On different levels and throughout all regions in Rwanda, tree planting interventions are rolled-out. Nurseries are established rapidly and in massive quantities. Trucks loaded with seedlings are driving across the country providing communities with seedlings for all these interventions.

Despite the growing interest in agroforestry, interventionists might not always explicitly label their projects as 'agroforestry' projects. They rather use terms that are more appealing for funding, such as 'tree planting' or 'reforestation'. In Rwanda, however, the interventions are often related to agroforestry. The trees are namely mostly planted on the plots of farming households, who often combine tree growing with the growing of other crops and the keeping of livestock. Yet, what is agroforestry exactly and how is it defined in this research? On the one hand, agroforestry seemingly has an agreed upon definition that will be introduced in the next section. On the other hand, its meaning, use and content tends to differentiate depending on the user of the concept. Moreover, as will be explained below, agroforestry should not be solely perceived as a bio-ecological phenomenon, but rather as a socio-cultural phenomenon.

Development of agroforestry

Agroforestry is an ancient practice (Cannell, 1988) and had long been considered as a palette of indigenous activities of land-use (Beer et al., 1998). The initial reasons to implement agroforestry activities were more related to producing foods than to growing trees and the subsequent influence on soil conservation. For years, agroforestry was not a practice of foresters. In the second half of the twentieth century, it spread through Africa. Today, agroforestry interventions are offered in the light of 'reforestation' and it is believed to have positive consequences for the (micro) climate and thus for farmers. In its early existence in Africa, agroforestry activities were thus not yet provided as a means to overcome the ecological consequences of 'destructive agricultural activities'. This has changed significantly, and farming households -especially in Rwanda- are perceived as a threat to the forest. In short, in the past the system was not yet considered as a contributing practice to the development of agriculture. This changed when the consequences of ecological degradation and worrying food situations became increasingly visible, subsequently leading to a growing interest in farming and intercropping systems and the attention of large international (scientific) organisations. Forestry projects became seen as a possible instrument to help the rural poor in development countries. According to scientific organisations concerned with agroforestry at the time (i.e. International Development Research Centre and FAO), however, crucial information was lacking. Therefore, in the 1970s the International Council for Research in Agroforestry (ICRAF) was established, nowadays known as World Agroforestry (Cannell, 1988). With the establishment of ICRAF, agroforestry became recognised as an improved land-use system interesting for scientists (Beer et al., 1998). The focus within science had long been dominated by biological and physical aspects of agroforestry, whereas throughout the years the interest in the socioeconomic aspects of agroforestry have grown (Leakey, 2017; Mercer & Miller, 1998). The following definition of agroforestry of the Food and Agricultural Organisations of the United Nations (n.d., para. 1) portrays this shift: "Agroforestry can also be defined as a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels''. In all, agroforestry thus developed from what was an ancient practice into what is now also a popular 'science-based' practice of which the definition and use are still subject to change.

Returning to the situation in Rwanda, the quantity in which agroforestry (tree planting) projects are rolled out, makes it even more crucial to ensure that communities are sufficiently consulted, involved and engaged in interventions. Hence, it is crucial not to neglect agroforestry as a socio-cultural phenomenon. When it comes to interventions, scientific evidence (e.g. of fast-growing species) is

often perceived as the 'holy grail'. In Rwanda, the focus tends to be on technical scientific evidence as social sciences are generally less respected in the country. Moreover, substantiating proposals for interventions with technical scientific evidence might generate more funding opportunities for these organisations as these are believed to guarantee the delivery of a priori set quantitative outputs. Approaching agroforestry as a (technical) scientifically based practice might, however, create blind spots regarding the socio-cultural characteristics of agroforestry in Rwanda. The representation of values, priorities, needs and challenges of these communities should at least be equally valued to the desired quantitative outputs. These socio-cultural aspects, logically, co-determine the eventual uptake of interventionist agroforestry activities. Nevertheless, when looking at what is generally described as 'challenging' adoption rates of agroforestry activities in Rwanda, it is often a lack of capital, skills, quality seeds, illiteracy and market inaccessibility that are referred to as hindering adoption (Kiyani et al., 2017). Hence, it is not values or worldviews that are addressed or considered in the interventions. It is merely shortcomings or difficulties that are determinative in these processes. Briefly stated, the massive scale and pace in which tree planting interventions are rolled out in Rwanda require critical reflection and the inclusion of a social sciences perspective may contribute to this.

1.1 Problem statement & research outline

Tree planting interventions in Rwanda seem promising for strengthening of the livelihoods of Rwandan farming households and for improving the (micro) environmental conditions they are dealing with. As previously mentioned, the scale on which these interventions are being rolled out is impressive yet worrying. In Rwanda, over a dozen of organisations are involved in tree planting interventions. Als governmental organisations are involved in such interventions. Despite the presumably good intentions of these organisations, 'tree planting' nowadays is clearly also a popular funding strategy. The aims, focus and strategies of organisations differ. NGOs take on different approaches and designs and implementations thus vary significantly. The majority of NGOs involved in tree planting in Rwanda focus on the 'knowledge gap' of local communities and thus farmers, whilst introducing 'modern' agroforestry technologies. Besides this assumed knowledge gap, many organisations focus on the (in)accessibility of resources, e.g. agricultural inputs and seedlings. By offering 'from the shelf' technology packages, the priorities, needs, values and knowledge of the beneficiaries of the programmes are often overlooked and thus not sufficiently or thoroughly consulted. This contributes to the extinction of indigenous agroforestry.

Creating a broader understanding of the agroforestry activities present in Rwanda, implies also recognizing and acknowledging the value of indigenous Rwandan practices in i.e. the conservation of nature. In doing so, a potential contribution can be made to the sustainability of agroforestry interventions. Planning and implementing interventions based on the assumption that farmers lack skills and knowledge without consulting them thoroughly does not only undermine the capacity and agency of farmers, but it also endangers the sustainability of these interventions. Moreover, it entails the risk of (unintentionally) 'harming' target groups, organising interventions that are doomed to fail and contributing to the extinction of indigenous (agroforestry) knowledge and activities. In other words, the dominant presence of intervention and their increasing claims on land compete with the existence of communities' indigenous knowledge and activities.

From my observations, I expect a tendency of organisations involved in agroforestry projects in Rwanda to overemphasise on scientific expertise and technological improvement and to accordingly neglect indigenous knowledge and activities. As previously mentioned, I furthermore expect this to be possibly harmful to target groups, projects and the existence of indigenous agroforestry. Based on these expectations, I formulated the following hypothesis: *agroforestry interventions in Rwanda generally do not consult and include indigenous practices related to agroforestry.* The methods and methodologies used to investigate this hypothesis are elaborated upon in the Chapter 3 'Methods and methodology'.

Based on the hypothesis and the focus of this research, the research question is the following: **'What are (indigenous) agroforestry practices in Rwanda and what role do they have in tree planting interventions?'.** As illustrated in the question itself, it consists of two elements. The first component dives into the agroforestry practices in Rwanda and aims to unravel if indigenous agroforestry practice can be distinguished from agroforestry practice in tree planting interventions. The second component of the question looks at the aggregation of these practices and to what extent there is space (or are arising possibilities) for the integration of indigenous agroforestry in these tree planting interventions.

The sub questions (see beneath) of this research will dive into agroforestry practice, how it relates to worldviews, how agroforestry practices aggregate and what role there is for indigenous agroforestry in interventions.

- What are agroforestry practices in Rwanda?
- How do these agroforestry practices relate to worldviews?
- How do indigenous agroforestry practice and interventionist agroforestry practice aggregate?

2. CONCEPTUAL FRAMEWORK

This conceptual framework sets the stage for the interpretation and understanding of the academic context in which the research is embedded. Reversely, the academic context helps understanding the problem embedded in this research. Notably, the idea is not to present an exhaustive and static overview of theories and concepts. The concepts used within the research do not exist in isolation and have changed over time and in place, thus this framework rather functions as an instrument to help getting a grasp of the dynamics between these theories and concepts and how this relates to the situation in the field. Firstly, the academic context is briefly introduced. Thereafter, social practice theory is elaborated upon and introduced in relation to the geographic and thematic context of this research. Lastly, exogenous and endogenous approaches to development interventions are discussed.

2.1 Moving beyond 'technical and behavioural' interpretations of agroforestry

The deforestation activities (mainly perceived as a consequence of subsistence farming) in Rwanda are worrying. To illustrate this, Global Forest Watch (n.d.) displays how Rwanda experienced an 8.2% decrease in tree cover since 2000. Both governmental and non-governmental organisations are implementing tree planting interventions hoping to change farmers' agricultural activities. Accordingly, these 'new' activities and technologies should contribute to improving socio-economic and ecological conditions. In such interventions and from a behaviour change theory lens, there is a possibility of neglecting the values of indigenous knowledge and activities in the introduction of 'new' and 'modern' technologies (Hargeaves, 2012; Shove, 2010). Social practice theory is central to this research and applied to agroforestry in Rwanda. The social practice theory lens provides 1) the opportunity to zoom-in on how practices are constituted and 2) to zoom-out on how practices (inter)relate and how they are shaped or challenged by spatial and temporal developments (Spaargaren et al., 2016). Moving beyond theories of behaviour change not only embodies the starting point of this research, it also contributes to understanding the broader tree planting intervention dynamic in Rwanda. The following section will firstly dive into pitfalls of behaviour change theory and will subsequently elaborate on social practice theory and what can be gained by using this social practice theory lens.

2.2 Theories of practice

Unfortunately, theories on behaviour change theory and theories of social practice have incorrectly been used interchangeably, whereas they have a different if not opposite intention. Hargreaves et al. (2007) note how, ironically, a 'practice lens' also gets used to interpret behaviour change even though theories of practice are unrelated to behaviour. Hargreaves (2012) and Shove (2010) are amongst the academics who agree upon moving beyond behaviour theories that, according to them, tend to neglect values and context in the background of climate change and sustainability.

Even more, a decontextualised understanding of behaviour results in the suggestion that behaviour can be changed by imposing corrections. It can even be considered a nudging strategy (Hargreaves, 2012; Shove, 2010). Elisabeth Shove (2010) also touches upon this discussion by urging to move beyond the what she calls dominant 'ABC-paradigm', referring to 'Attitude', 'Behaviour' and 'Choice'. As reported by Shove (2010) this paradigm causes blind spots and sustains certain forms of governance as it is based on the assumption that behaviour of individuals is in need of correction, for which policy makers and programmes ought to be (or consider themselves to be) responsible. According to Shove (2010) this indicates a 'service provider mentality'. This service provider mentality accordingly (to an extent) moves the responsibility from e.g. governments to -in this case- local communities.

It took some time before theories of practice were taken up as a framework for research. The most prevailing description of practice is given by Reckwitz (2002, p. 249): "a practice, as a block or pattern, consists of interdependencies between diverse elements including forms of bodily activities, forms of mental activities, "things" and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge". Moreover, Reckwitz regards practices as "'routines of moving the body, of understanding and wanting, of using things, interconnected in a practice'" (Spaargaren et al., 2016, p. 7). Individuals herein function as *carriers* or *practitioners* of practices that maintain a certain lifestyle, have agency and are capable of setting in motion transformation. Therefore, practitioners should not be approached in isolation as they are connected to practices and vice versa (Shove et al., 2012; Spaargaren et al., 2016). This study is predominantly based on the work of Shove et al. (2012, p. 14) in that the three elements of practice they distinguish are centralised in this research. These elements are: materials, competences and meaning (listed below). Shove et al. (2012, p. 14) argue that "practices emerge, persist, shift and disappear when connections between elements of those three types are made, sustained or broken".

- "Materials (including things, technologies, tangible physical entities and the stuff of which objects are made);
- Competences (which encompasses skill, know-how and technique); and
- Meaning (in which we include symbolic meanings, ideas and aspirations)."

Seeing that in previous research, social practice theory has not yet been applied to agroforestry in a Rwandan context, several studies (Palo & Rica, 2013; Spaargaren et al., 2016) have been consulted to understand and compare reasons for applying agroforestry to social practice theory. Motivations to apply social theory of practice, include moving away from 'container' or 'umbrella concepts' that do neither provide insight into the diversity of practices nor into what they are constituted of. In a study on urban food growing similar concerns are raised mentioning how this might as well pose risks to losing sight of "the multiple logics, dynamics and forms which are present within the field of urban food growing" (Spaargaren et al., 2016, p. 154). These considerations are also applicable to agroforestry, which is a more dynamic practice than often portrayed. Agroforestry in Rwanda has changed from what was an indigenous activity into one that is now mainly used for the direct creation and/or strengthening of livelihoods of farmer households and - to some extent - by NGOs for raising funds in the guise of 'greening' their activities and their 'brands'. Hence, agroforestry as a practice is not static, it develops in time and space. For these reasons, diving deeper into what distinct agroforestry practice entails and thus staying away from using it as a container concept (e.g. 'reforestation' or 'greening' efforts) might reveal how agroforestry practice is not always identified by the same 'doings and sayings' (Spaargaren et al., 2016). A social practice theory lens thus provides the opportunity for a more nuanced and closer view on agroforestry practice in Rwanda. Moreover, it goes without saying that agriculture itself is a socially constructed entity responding to temporal and spatial processes. Or as phrased by Den Biggelaar and Gold (1995, p. 254) "people in different environments have devised diverse solutions to problems and constraints they encountered in the natural and social environment, resulting in a multitude of agricultural systems."

In this study, indigenous agroforestry practice and interventionist agroforestry practice are distinguished. Zooming-in and out on how these practices as a concepts differ, helps getting insight into possible overlap, differences or contrasts. Moreover, it provides insight into relations between insiders and outsiders of a social practice and on how differences (e.g. global vs. local, commercial purposes vs. balance between production and preservation) create inequalities between the 'carriers' or 'practitioners' of these practices. Amongst such inequalities -arising from the reproduction of social practices- are unequal power relations and distribution of values, knowledge and skills (Spaargaren et al., 2016). Despite the assumed 'flat ontology' of social practice theory -especially from a transition theory perspective- (Spaargaren et al., 2016), social practice theory is increasingly relevant for larger social phenomena, as it provides the opportunity to look at power relations that interact in broader nexuses and bundles of practices.

The ongoing dynamics of e.g. context, power and mind-set are fundamental in this research. Therefore, this research is based on the *transformative research paradigm* paying attention to power dynamics and topics of marginalisation. This paradigm, however, does not address indigenous worldviews in an in-depth manner. Therefore, this research also leans towards the *indigenous paradigm*. The indigenous paradigm contributes to understanding the indigenous Rwandan worldview (Chilisa, 2012). Moreover, it has committed me as a student researcher to pose questions on voice, representation, rights and on ownership of knowledge production whilst acknowledging the colonial past of the historically silenced researched. Clearly, in the context of Rwanda, this can by no means be neglected. For these reasons, I prefer to use 'indigenous' instead of 'traditional' as the suggests a form of subordination in that it can be perceived as 'static' or 'primitive'.

2.3 Endogenous and exogenous development

The popularity of tree planting interventions in Rwanda makes it prone to risks and failures. Without doing solid and sound research on the site and making sure that there is enough knowledge on what is already available in terms of knowledge, culture, resources, etc. the sustainability of such interventions can be questioned. Motivation to undertake research or due diligence prior to designing interventions tends to get compromised by time. This, however, largely depends on the approach taken by interventionists. Two development approaches can be distinguished, namely an endogenous development approach and an exogenous development approach. The exogenous development approach literally indicates 'coming from without', and can be considered a top-down approach. In exogenous development, "the dominant development priority has been economic growth as opposed to livelihoods and social/human development" (Holcombe, 2014, p. 750). Oppositely to the exogenous approach, endogenous indicates 'coming from within'. "Endogenous development is development that is based mainly, though not exclusively, on local strategies, knowledge, institutions and resources. It involves a continuous process of adaptation and innovation, starting from within the local community. It implies working with people instead of working for them." (ETC Compas, n.d., p. 6). The main prerequisite is that in endogenous development, projects or programmes are controlled locally. Moreover, the idea is to strengthen farmers' capacity in solving their own problems, whilst putting forward a bigger variety of options and paying attention to not romanticising the views and activities of those farmers. Hence, the strategies, cultures and worldview of people are central in endogenous development (ETC Compas, n.d.). In this Rwandan context, this could indicate integrating aspects of the Bantu philosophy called Ubuntu (in Kinyarwanda known as Ubumuntu), which refers to living in harmony with and respect for humans, non-human beings and the natural world. Within African philosophy, intergenerationality is a common principle. Intergenerationality is understood as the responsibility of generations to take care of their lands, both in respecting previous generations (ancestors) as to provide for the needs of future generations (the yet-to-be-born) (Kelbessa, 2015). Accordingly, organisations could aim to better understand values and meanings of e.g. nature and trees for Rwandan communities from an African (instead of mainstream Western) perspective. Moreover, their (indigenous) knowledge could be consulted and included. Hence, the question that arises is: are organisations involved in agroforestry programmes proponents of endogenous development approach or do they perhaps either intendedly or unintendedly lean more towards exogenous approaches? Or do these organisations find themselves in a grey area between these approaches as it is not always possible to distinguish them as they do not exist in isolation, especially not in praxis.

3. METHODS & METHODOLOGY

This chapter dives into how the research questions were answered by collecting data through a case-study approach. Firstly, the research design and methodology are discussed, thereafter the research site and context are introduced. Thirdly, the methods deployed for this research are outlined followed by an outline of the used analysis methods and ethical considerations.

3.1 Research design & methodology

Up until now, research on agroforestry in a development context in Rwanda has been largely based on quantitative inquiring methods. In this research, however, qualitative methods have been deployed to look at agroforestry as a contested social practice. Qualitative methods are relevant for this study as it intends to shed light on possible meanings and values embedded in agroforestry practice. Hence, the aim of qualitative research to "address questions concerned with developing an understanding of the meaning and experience dimensions of humans' lives and social worlds" (Fossey et al., n.d., p. 717) corresponds with the objectives of this study. The chosen design of this study is a case study approach. Whereas the research design also contains elements of what is referred to as an ethnographic approach, it predominantly fits under the case-study approach as it aims to "paint a very comprehensive picture of how the issue under study manifests itself within the case" (Skovdal & Cornish, 2015, p. 38). Which, in this case, would refer to how the tree planting pilot of 100WEEKS relates to the broader dynamics (i.e. zoom-out lens) in the field of tree planting interventions in Rwanda. Multiple methods are involved in this case study research adding up to "detailed examination of the case from many different sources of information" (Skovdal & Cornish, 2015, p. 37). The data collection methods used in this research are semi-structured interviews, focus groups and participant observation.

3.2 Research site & context

As previously touched, 100WEEKS has been central in realising this study. 100WEEKS is a cash transfer organisation supporting women in (amongst others) Rwanda to develop sustainable sources of income through cash, training, and membership of village savings and loan associations (VSLAs) (100WEEKS, n.d.). In 2023, 100WEEKS Rwanda expanded their regular activities by launching a tree planting pilot in Rwaza Parish, in Musanze district. The focus groups in this study have been set-up in relation to this pilot. Moreover, experiencing the developments around this tree planting pilot (e.g. nursery establishment and seedling distributions) have been insightful for participant observation. The women from the groups that participated in the first two focus groups are connected to the Rwaza Parish. This is the location where the women have weekly trainings given by a coach from 100WEEKS who supports them with the organisation of VSLAs. Moreover, Rwaza Parish is the location where the tree planting pilot took place. The third focus group was also organised in Musanze District, but took place in Ruhengeri Parish. This group did not participate in the tree planting pilot. All three focus groups have been invaluable, yet the geographical scope of the focus groups stays limited to Musanze district.

p.t.o.

Figure 1: Rwanda map with districts (maps Rwanda, n.d.)

Also the interviews and participant observation were mainly centred around Musanze District or took place in Kigali. Admittedly, the Rwandan landscape is highly diverse as it consists of twelve agro-ecological zones (Mugabowindekwe et al., 2018), which accordingly has an impact on the socio-ecological conditions shaping communities livelihoods. Despite the variety on many levels in Rwanda, he limited geographical scope of the case-study does not necessarily mean that it cannot be generalised (Clay & Dejaegher, n.d.) as it aims to add to "a collective process of knowledge accumulation in a field or in a society" (Flyvbjerg, 2011, p. 227), whereas in the field of qualitative research in Rwanda on agroforestry this might still be in infantry.

3.3 Methods

3.3.1 Selection of research participants

In the proposal for this research, an overview was created of possible research participants to reach out to whilst being in the field. Clearly, on forehand it was not yet clear who I would be able to invite and include in the eventual data collection. I was located in Musanze where the office of 100WEEKS is located (Northern Rwanda) and I often went to Kigali for interviews with NGO representatives and scientists. 100WEEKS Rwanda has enabled me to start interviews with two women from their women groups, and with their employees. They also introduced me to agronomic scientists and other NGO representatives in their network. As I expected and partly initiated, the snowball effect soon paid-off in helping me to get in contact with research participants. Interview participants often shared recommendations on who else to approach for the data collection. In most cases, the links in their professional networks were clear and even overlapping with recommendations of other participants. This, to me, indicated the potential of the contact and also contributed to the willingness of these

contacts to participate. Whilst selecting participants, I always considered the importance of involving different perspectives on the topic.

3.3.2 Interviews

In total, 12 interviews were conducted. A detailed overview of the research participants (and locations and dates of interviews) can be found in Table 1 'Interview participants'. The interviews can be roughly allocated into three groups: NGO representatives (4), scientists (4) and local stakeholders (3). For each group, a topic guide was created on forehand. Clearly, these guides were tested and adjusted throughout the process and got adapted to the background of each participant (see Appendix I.I 'Example of interview topic guide').

Table 1: List of interview participants

Participant number	**Referred to as**	**Location**	**Date**
1	Woman 1	Rwaza Parish	12-10-2022
2	Woman 2	Rwaza Parish	12-10-2022
3	Coach	Rwaza Parish	12-10-2022
4	NGO representative 1	Musanze	12-10-2022
5	NGO representative 2	Kigali	18-10-2022
6	NGO representative 3	Online	24-10-2022
7	Scientist 1	Kigali	28-10-2022
8	Scientist 2	Kigali	02-11-2022
9	Scientist 3	Kigali	07-11-2022
10	Entrepreneur	Kigali	18-11-2022
11	Scientist 4	Kigali	12-12-2022
12	NGO representative 4	Musanze	14-12-2022
13	Traditional healer	Kinigi	14-12-2022

The semi-structured interviews were aimed towards gaining in-depth and diverse insights on the designs of tree planting interventions and policies and on how local and indigenous knowledge is (or is not) valued and included in project designs, research and policies. Whereas the scientists, NGO representatives and women already provided a variety of perspectives to these topics, this did not sufficiently represent the perspective of central community members with indigenous knowledge on the matter. With the help of 100WEEKS Rwanda, I managed to visit and interview a traditional healer and his family to better include their perspective in the data. Moreover, I was also motivated to interview someone who had a different view on tree planting interventions and therefore I got in contact with an entrepreneur.

3.3.3 Focus groups

As previously mentioned, three focus groups were organised with women from 100WEEKS women's groups. The motivation to organise these focus groups was the opportunity to dive deeper into subjects as social norms, meanings and experiences of these women. Moreover, it gave the women space to elaborate on issues occurring in their own thoughts (Skovdal & Cornish, 2015). The first two focus groups took place with women from groups that were included in 100WEEKS tree planting pilot. In order to also include the perspectives of women that had not been part of this pilot, a last

focus group was organised with a group who did not participate in the pilot. In total, 24 women joined the focus groups. The topic guides (see Appendix I.II 'Example of focus group topic guide') for the first two focus groups were similar, whereas the topic guide of the last focus group slightly differed from this. Answerability, intuitively, concreteness and sensibility of questions were taken into account whilst establishing these topic guides. In the first two focus groups the questions were more related to how the women experienced the first months of the pilot and what their expectations were. Seeing that the last group was not part of the pilot, and did not yet receive the seedlings, this group provided a chance to ask questions with a clean slate and see what possible role social desirability played in the previous groups.

Table 2: Overview of focus groups

Number focus group	**Number of women participating**	***Included or excluded in 100WEEKS' tree planting pilot?***	**Location**	**Date**
Focus group 1	8	*Included*	Rwaza Parish	10-11-22
Focus group 2	8	*Included*	Rwaza Parish	16-11-22
Focus group 3	8	*Not included tree planting pilot*	Ruhengeri Parish	23-11-22

Inevitably, the organisation of these focus groups has been challenging and came with limitations. One such limitation is the pre-existing structure of the groups. Yet, these limitations did not weigh out the benefits as these women have been part of these groups for some time and the possibility of them feeling comfortable to share input was therefore higher. Within the focus groups, I aimed to arrange a variety in age (20 - 45) to involve perspectives and knowledge from people in different age categories. Undoubtedly, and as briefly touched upon, challenges arose regarding social desirability and generalisability. Attempts had been made to limit this by explaining my independency from the organisation, by making sure that every woman could contribute in discussions and by underlining the relevance of variability in answers.

Translation

The eventual organisation and transcription of the focus groups and some of the interviews resulted from a close collaboration with two translators who both recently graduated at the Institute of Applied Science Ruhengeri (INES) and who are now full-time employed by 100WEEK as enumerators. With both of them, I have been spending time getting familiar with each other, our academic backgrounds and the aims of the research. Moreover, before and after the interview or focus groups we discussed the aim of the particular interview or focus group and we took time to evaluate it. Throughout the process, for example, I noticed how the questions increasingly became more in-depth and explanatory. These translators have been essential in translating the questions (making them appropriate in both language and culture), moderating the focus groups and have been of great support in the transcriptions of the interviews and focus groups that were held in Kinyarwanda.

3.3.4 Participant observation

Participant observation was used in addition to the interviews and focus groups. Participant observation mostly took place during field visits, e.g. whilst visiting nurseries, women groups or simply by going in the field myself. Forthcoming fieldnotes provided insights into daily real-life activities and provided a way to include not only what people say, but also what they do. This is valuable seeing the non-discursive nature of a practice. Participation of researchers in the social practice they investigate is necessary and a prerequisite (Spaargaren et al., 2016, p. 17). "Only by actively participating in the practice under study, researchers gain practical understanding and are able to acquire inside knowledge and skills in relation to the nature of the practice, their rules and teleo-activities".

3.4 Data analysis methods

All interviews and focus groups have been recorded and transcribed. Analysis methods were used to condense the gathered materials and to provide transparency into how key messages and interpretations arose. The transcripts and fieldnotes were analysed using thematic analysis and accordingly coded in ATLAS.ti. The materials were coded inductively, to remain open for new perspectives or interpretations and to thus challenge myself in staying open to learn new things and to be surprised by the data (Skovdal & Cornish, 2015). To an extent, the approach was hybrid as codes were created whilst having a rough idea possible categories these codes would fit based on the conceptual framework (e.g. development approaches or the different elements of a social practice). Eventually, after the initial coding stage, definite categories were established and codes were categorised. However, by the iterative coding process, these categories and the analytical gaze have always been subject to change. The coding structure can be found in Appendix II 'Coding structure'.

3.5 Ethics & positionality

3.5.1 Informed consent & transparency

This research largely depends on the insights from the participants. Therefore, it is crucial to recognise the importance of handling the information shared by the participants with care. The idea is to prevent any form and possibility of doing harm, which demands extensive preparation and transparency. On forehand, the interviewees have been orally asked for consent regarding the recording, transcription and use of possible insights in the research. For privacy and confidentiality reasons, both interview and focus group participants are referred to in an anonymous manner (Table 1 'List of research participants'). Throughout the interviews and focus groups, it was emphasised that, in case participants would not feel comfortable with answering certain questions or discussing certain topics, they should not feel obliged to do so. Whereas the interview guides were leading in the process, reasonable space was offered for participants' own concerns or issues they wanted to raise. This has been a valuable contribution in understanding their concerns and priorities.

Prior to the focus groups, the context of the research was introduced by the translator who facilitated the focus group. After that introduction, the women received a small piece of text which briefly stated the purpose of the focus group and the careful handling of information (see Appendix III 'Consent form focus groups'). The emphasis on the purpose of the focus group functioned to not raise any false expectations (also possibly unrelated to research purposes) that could not be fulfilled. Moreover, I have made the deliberate decision to hold the focus groups with the women in their own language (for a sense of comfortability, flow and taking into account the implications of my verbal presence) and thus trusting (and preparing) the enumerators - who have been in touch with these women before - to moderate the groups. Even though the women of the groups have a busy life taking care of their families and working most of the day, they made time to participate in this research. To make the women feel more at ease I joined them in their prayer, we danced and I expressed my gratitude in words and by bringing refreshments for the women and their children.

3.5.2 Personal bias & worldview

My personal bias and worldview should be considered and acknowledged seeing the high possibility of the influence it has on the interpretation of the data. Understanding the local culture and worldview has been challenging, seeing the rich culture and complex history of Rwanda. Whilst tracking my thoughts and experiences I came to the realisation that it is nearly impossible to speak of a 'Rwandan' culture. Nevertheless, as a student conducting research, I have always attempted to understand the Rwandan culture(s) as far as possible within a three-month timeframe. Throughout my stay my understanding of the implications of the historical events in Rwanda grew. Living and being in a Rwandan social environment contributed to the process of understanding and recognizing

the severity of it. For centuries, culture(s) in Rwanda have been pressured significantly. This makes it nearly impossible to comprehend, sum up or describe something as a 'Rwandan culture'. The cultures that I have been introduced to are diverse and dynamic and are fundamental in understanding this research and the stakeholders within it. Surely, this has implications for how I have dealt with positionality, which will be discussed in the following section.

3.5.3 Positionality

As described by Chilisa (2012) reflecting on one's positionality is a crucial component of the research' validity. Chilisa (2012) refers to this as 'positionality' or 'standpoint judgments'. The idea is that knowledge is related to a 'standpoint argument', thus: "what counts as knowledge is tied to the interests and perceived purposes of knowledge of different interest groups" (p. 151). Being a Dutch (female) master student, having little to no experience in the field or with conducting research by using interview and observation methods, undoubtedly has an influence on how the participants and gathered data is perceived. Even though I gained some awareness of this in previous courses on African Philosophy, Social Justice and more generally on the influence of research on local communities, it is impossible not to be biased or to fully understand someone else's (nearly opposite) worldview. Some measures were taken to acknowledge my bias and positionality and to avoid it from doing harm, e.g. including characteristics of indigenous research methods and creating a comfortable environment (especially in the focus groups) and space for research participants to raise issues themselves.

Besides positionality, it is also crucial to be aware of reflexivity referring to "the assessment of the influence of the researcher's background and ways of perceiving reality perceptions, experiences, ideological biases, and interests during the research" (Chilisa, 2012, p. 147). In the light of positionality and reflexivity, I have thus been journaling my "thoughts, feelings, frustrations, fears, concerns, problems, and ideas" as described by Chilisa (2012, p. 147). Still, it would be naive to think that research is not impacted by the researcher who in fact is 'the main data collection instrument'.

4. RESULTS

In this chapter the results are presented. The results chapter starts with an elaboration on how agroforestry is perceived from a Western and from an indigenous worldview (4.1 'Agroforestry & worldviews'). By doing so, the stage is set for the further understanding of how, in this study, indigenous agroforestry practice is distinguished from interventionist agroforestry practice based on the elements making up the practice (4.2 'Agroforestry practices in Rwanda'). Lastly, the aggregation of indigenous agroforestry practice and interventionist agroforestry practice (4.3 'The aggregation of agroforestry practice') is discussed.

4.1 Agroforestry & worldviews

This section aims to provide an answer to the research question: how does agroforestry relate to people's worldview? Starting the results chapter with this question is a deliberate choice. The history of Rwanda and especially the influence of colonisation on Rwandan traditions should by no means be underestimated. Therefore, the chapter firstly pays attention to this topic. Thereafter, connections are made between the Bantu philosophy Ubumuntu and the Rwandan indigenous worldview. Lastly, agroforestry from a Western worldview is elaborated upon.

Before beginning this chapter, it should be acknowledged how diverse the African continent is in social practice. Unfortunately, the colonial period did not leave these cultures and customs unharmed. Still, Africa consists of over 50 countries in which more than 700 million people live who accordingly speak more than 1000 languages, so there is clearly no lack of diversity within the continent. Therefore, it is important to realise the following: "Africa is one of the richest in culture and customs. Culture is essential in the lives and future developments of Africans. Culture embodies their philosophy, worldview, behaviour patterns, arts and institutions" (Adekunle, 2007, p. VII).

4.1.1 Indigenous worldviews in Rwanda and the influence of colonisation

Rwanda is often referred to as "The Land of a Thousand Hills" or "the Switzerland of Africa". Today, however, the image that many people have of Rwanda often is associated with the genocide. Even though it is crucial not to forget about these experiences of ethnic violence, it is also important to pay attention to the richness of the history, culture and customs of Rwanda before the genocide and the colonial rule. Most people in Rwanda speak the Bantu language 'Kinyarwanda', and English has since 2002 been the official second language in the country (which had formerly been French and got changed overnight). From many conversations during my stay in Rwanda it became clear that one cannot deny how much has changed in Rwanda -and many other African countries- since the European Christian missionaries changed many aspects of the Rwandan culture(s), e.g. introducing Western education. In precolonial times, the social practice of Rwandans implied forms of education in which which dignity, diligence, discipline, mutual respect and tolerance were central (Adekunle, 2007). Also indigenous activities, such as basketry, pottery and weaving used to be included in the curriculum. Religion logically also plays a role in this. Before colonisation, religion had a key role in the culture and customs of Rwandan people. Rwandans were considered "indigenous worshippers" before the Christian and Islamic religions entered the country. "Sacred objects, persons, places, and natural phenomena were revered. Ceremonies and rituals were performed on a regular basis to appease gods or ancestors. Individuals as well as clans held life and religion as sacred. Religion was real to Rwandans because it was a part of every aspect of their lives from birth to marriage to work to illness to death" (Adekunle, 2007, p. 27). Indigenous Rwandan religions obviously differ from other religions that have been introduced into the country ages ago e.g. Christianity. The quote below illustrates how, for example, the interpretation of 'god' differs significantly: "The word Imana (God) refers to both the creator and the essence of life, as well as the fertility of land (earth) and humans. This fertility essence manifested itself in a variety of objects used to forecast favourable outcomes. However, the Imana concept discussed above is not the same as the one found in Christianity. Their faith was concerned with the survival of ancestors after death. The latter were divided into two groups: benevolent ancestors and evil ancestors" (Niyitegeka, 2021, par. 4).

4.1.2 Nature, Rwandan Traditions and Ubumuntu

In the interviews, the loss of traditions through the 'civilisation' was a recurring subject. Plenty examples were brought to the fore on what had been lost and how such traditions played a central role in the conservation of nature. To illustrate this, in the interviews it was mentioned several times how in Rwanda tribes used to have their own 'toto' or 'emblematic animal' which was said to protect the community. The community had to take care of and protect their emblematic animal which in fact contributed to conserving biodiversity. Whilst interviewing a Rwandan NGO representative, the relation between Rwandans and nature was discussed with concrete examples of the meaning of proverbs and emblematic animals in Rwandan traditions:

There used to be proverbs in Kinyarwanda, from many years back when my grandfather used to tell me. They used to say that people should pay attention to nature. For example, they say if you make this dead, your eyes will not be able to see anymore. Also, there are some trees that they use and they say if you cut it, it will be bloody. You will see blood coming from it. It used to be like a kind of people paying attention to nature. But with civilization, all those made no sense, they said it was meant to scare people. That is when people started to feel like everything is normal: cutting trees, killing animals, doing whatever they want against nature. That contributed to the destruction of nature. Maybe, back in the days, it was not easy to explain and convince people about what you wanted to tell them. That is why maybe they decided to turn it into something like that (ref: proverbs, emblematic animals). But it was just to protect nature (NGO representative 1, Musanze, 12-10-2022).

Rwandan culture, customs and beliefs are rooted in African philosophies such as the Bantu Ubuntu philosophy. In Kinyarwanda, Ubuntu is called 'Ubumuntu'. In an African worldview, such as Ubuntu, there is a strive for (the restoration of) harmony between human beings and the natural world. "Ubuntu is a comprehensive ancient African Worldview based on the values of intense humanness, caring, sharing, respect, compassion, and associated values, ensuring a happy and qualitative community life in the spirit of family" (Kelbessa, 2015, p. 395). According to the Rwandan participants (from both interviews and focus groups) and as became apparent in observations, Ubumuntu still plays a role in the Rwandan society. In Rwanda, Ubumuntu became even more central and symbolic after the genocide. As one can see at the Genocide Memorial in Kigali, Ubumuntu is defined as humanity - goodness, generosity and kindness - and underlines the importance of humanness. Ubumuntu also has its own Imigongo (indigenous Rwandan wall art), shown beneath:

Figure 2: : Imigongo sign of Ubumuntu (DevelopmentAid, n.d.)

Also in relation to nature, Ubumuntu has its place in Rwandan worldviews as becomes apparent from proverbs and the example of the emblematic animals. Some of the insights on how Ubumuntu and nature relate in a Rwandan worldview are displayed below:

By using an example, I told you that I heal people, without asking money. So, if i heal someone it means that you have Ubumuntu; sympathy, love, loving everyone. This is part of Ubumuntu. (...). In Ubumuntu there is sympathy, so if I take that indigenous tree or medicine tree and then try to heal someone with any disease, the relation between Ubumuntu and that indigenous tree is that it helps me to heal that person. Another thing I can say is something my mother said and I am thinking about: if I found someone who is trying to cut that tree without any permission, that means that he doesn't have Ubumuntu by cutting it. Especially for those who

know its role (referring to the tree). So by having Ubumuntu he has to protect, whenever it is not his own, but because it has a big role in human life, he has to protect it as his own tree. Ubumuntu means protecting that tree.

For example if there is a bird over there and you would take it and kill it, why? Did it do something? No, there is no Ubumuntu within you. If you have Ubumuntu; you love animals. Because sometimes they also help us. I mean those animals. So you have to protect them (Traditional healer, Kinigi, 14-12-2022).

Thus not only places or natural phenomena, but also trees have a special place in Rwandan indigenous beliefs and activities, e.g. wood carving and ceremonies (Scientist 3, Kigali, 02-11-2022). In the third focus group an example of a tree species in relation to such an indigenous Rwandan belief came to the fore. The tree species Umurinzi is also known as Umuko (Erythrina Abyssinica). This tree is said to have protected Ryangombe - a culture hero and powerful and celebrated ancestral spirit. The story goes that Ryangombe died after a buffalo hit him with his horns, but swayed the hero into the Umurinzi tree which held him until he died. On some important occasions, people nowadays still hold the tree leaves. Two other examples were shared during a visit to a traditional healer in Kinigi:

Let me tell you a short story. It is a short story about two kings Rwabugiri and Rwanyonga that (...) a long time ago. The two kings were having a drink and the one king (visitor) finished it too fast, and the other king gave him another drink but mixed it with some trees, called Umuhanga and it took him a long time to finish that drink. So it is a short story that tells us that some trees are like poison. Also, there is another one. For example, about the proverb "if you cut one, plant two", it is the proverb which encourages people. For example if you have a forest, don't cut all trees without planting any. If you cut some, you have to plant more (Traditional healer, Kinigi, 14-12-2022).

Throughout these quotations it becomes obvious how it is linked to the conservation of nature. In African practice, balance between production and preservation is key (Kelbessa, 2015). This contradicts Western worldviews in which the earth is often considered as an exploitative matter, functioning to sustain human beings. In his article "African Environmental Ethics, Indigenous Knowledge and Environmental Challenges" Kelbessa describes this as follows "Unlike mainstream Western ethics, African ethics has recognized the interconnectedness and interdependence of all beings and the more-than human world. (...) The unity of the whole established an ethical obligation for human beings toward nature." (Kelbessa, 2015, p. 387).

In his work on 'Customs and Culture of Rwanda', Adekunle (2007) also describes the connection of nature and religion. Adekunle describes this relation as 'interlocking and dynamic'. The intriguing hilly Rwandan landscape holds many natural features such as the Volcanoes in the North for example. According to Adekunle (2007), it was believed that volcanoes functioned as a place for spirits of people. "The people looked upon nature and the supernatural as sources of protection and as a means to provide for their daily needs". (Adekunle, 2007, p. 28). Also lightning (frequently occurring) was said to be a connective natural feature connected to spirits and evil forces, along with woods, forests, rivers. These places with its deeper meaning would drive people to consult ancestors and the *umuvuzi gakondo* (traditional healer) for protection.

To better understand agroforestry interventions in Rwanda and to what extent it is a contested practice, it is therefore important to also understand agroforestry from a Western worldview - in addition to the just described Indigenous worldview. Better understanding these interventions provides insight into how interpretations of the development of agroforestry as a practice differ. Whereas some would not interpret a mix of indigenous and modern agroforestry as negative, from a mainstream Western perception, this mix could be perceived as slowing down development. Hence, in the following section agroforestry from a Western worldview will be elaborated upon.

4.1.3 Agroforestry from a Western worldview

Whereas indigenous knowledge on agroforestry in Rwanda thus connects to principles of e.g. harmony and respect and is related to intergenerationality (as will be illustrated by using examples

from the focus groups in Section 4.2 'Agroforestry practices in Rwanda'), the emphasis or 'meaning' in tree planting interventions generally relate more to economic ends, such as the 'livelihood creation' in communities or the generation of funding for NGOs and development organisations. From the interviews and focus groups it became obvious that NGOs have relatively little interest in indigenous knowledge and that instead there is a strong focus on 'scientific' and improved technologies in these interventions.

Besides questions of epistemic justice, what should be discussed in the relation between agroforestry and Western worldviews is why agroforestry is interesting from this perspective and why it is becoming increasingly popular in development interventions. As previously mentioned, in mainstream Western worldviews, the earth is often considered as an exploitative matter, also referred to as an anthropocentric view of nature (Oruka & Juma, 1994). Agroforestry or 'tree planting' interventions are generally combined with carbon dioxide compensation strategies. Via monitoring and evaluation (M&E) systems (such as dashboards in applications), customers who buy trees to compensate for carbon dioxide emissions can often watch 'their' trees grow effortlessly from a far distance. Seeing the growing demand for this compensation, the integration of these M&E systems contributes to the attraction of funding which motivates NGOs to integrate tree planting in their projects. Obviously, it is other people taking care of these trees that are instructed to track the growth process of these trees for accountability reasons. Via these applications, companies and private actors can buy trees to compensate for pollution. Hence, a motivation to invest in tree planting interventions could as well be to enlarge pollution capacities (Entrepreneur, Kigali, 18-11-2022). Therefore, the focus on M&E takes away the attention from a design and implementation that best fits the values, needs and priorities of local communities. From the start, it is M&E that is prioritised.

In the following section (4.2 'Agroforestry practices in Rwanda') the elements that construct indigenous agroforestry practice and interventionist agroforestry practice will be discussed. This will provide a more elaborative image of both practices and how they are related to the above discussed worldviews.

4.2 Agroforestry practices in Rwanda

This chapter dives into the research question: what are agroforestry practices in Rwanda? Firstly, indigenous agroforestry as a practice is explained, thereafter interventionist agroforestry practice is elaborated upon. Both practices will be outlined by discussing the 'material', 'competences' and 'meaning' element as defined in Chapter 2 'Conceptual Framework'.

4.2.1 Indigenous agroforestry practice

Materials

Within the focus groups and in interviews, it was often mentioned that in the past species grew in places in which they cannot grow today. This indicates how over the years (micro) climatic and soil conditions have changed, and how these are amongst the factors influencing the variety of crops grown in plots. Whereas in tree nurseries (third photograph in Figure 3) today, only a selection of exotic species are grown, indigenous tree species used to be central in indigenous agroforestry practice.

Figure 3: Overview of different landscapes in- and outside national parks

Indigenous species are adapted to the context and generally need less inputs (traditional healer, Kinigi, 14-12-2022). Some indigenous species that are used in indigenous agroforestry practices today are: *Acacia abyssinica* (Umunyinya); *Erythrina abyssinica* (Umuko); *Iboza riparia* (Umuravumba). These species can be found in fields mixed with exotic species that have been in the landscape for a long time (Scientist 4, Kigali, 12-12-2022). Examples of such species include: *Dracaena afromontana* (Umuhati), *Ficus Thoningii* (Umuvumu), *Euphorbia tirucalli* (Umuyenzi).

Indigenous tree species are, however, disappearing from the Rwandan landscape. At a glance, it becomes evident how some species are dominantly present in the landscape. Especially *Eucalyptus globulus* (Inturusu/Ruvuvu/Salinya) and banana trees are remarkably present. When entering national parks like Volcanoes National Park or Nyungwe National park (see first photograph in Figure 2) it becomes clear how the Rwandan landscape currently does not represent what it (in some areas) could have looked like without human intervention. Yet, humans have been cultivating Rwandan soils for ages and it is thus not realistic to think that the whole country would look like a protected national park. Nevertheless, a visit to the parks reveals what untouched nature in Rwanda looks like. The rich biodiverse nature in these parks, however, is opposite to the realities in the field in which landslides for example are not an exception these days (see second photograph in Figure 2).

In indigenous agroforestry practices, inputs are produced locally and organically. Amongst indigenously produced inputs are organically produced insecticide and manure. Nearly all women in the focus groups mentioned how they rely on their domestic animals for the creation of organic manure which, hence, is an indigenous practice.

The variety of the use of tree species in indigenous agroforestry practice is a recurring item and gets confirmed by Ndayambaje et al. (2013, p. 20) who emphasise how in indigenous Rwandan agroforestry activities "the retention and management of indigenous tree species on farmlands is an important characteristic". The use of isolated trees and shrubs is an indigenous practice in Rwanda. Throughout observations and as generally agreed upon in research, the origin of species (e.g. exotic or indigenous) and the use of diverse species are recognisable characteristics of indigenous agroforestry practice. Accordingly, the origin of tree species is central within the material element of indigenous agroforestry practice. The species in indigenous agroforestry practice were used to provide for, e.g. medicine, fertility, clothing, fodder and wood (Mukuralinda et al., 2016).

Competences

Throughout the focus groups several women mentioned how the women got passed on knowledge on tree planting from their parents. Also in the interview with the traditional healer, it became

evident how in indigenous agroforestry practice knowledge got passed on from one generation to another orally. Moreover, with this family I discussed how community members consult them for advise on traditional medicine. This traditional healer explained how their family is one of the few people left in the area who have knowledge on the growing of a large number of (indigenous) medicinal trees. He also expressed his concerns seeing that the knowledge in his family is still crucial for the community, but how the profession of a traditional healer becomes less popular and is threatened by the inaccessibility of indigenous tree seedlings and exogenously introduced interventions that promise farmers more income generation. Regarding skill and know-how it is thus essential to realise how, indigenously, knowledge got passed on orally from generation to generation (Oruka, 1990).

Before diving into the skills and know-how that partly constitute indigenous agroforestry practice, it is necessary to understand how epistemological processes shape this element. Christoffel den Biggelaar (1996) discusses how what is understood as a tree in Rwandan epistemology differs from the Western perception of trees. Den Biggelaar (1996) documented that 'trees' in Rwandan epistemology also include 'plants that are not grasses. In Rwandan epistemology trees thus encompass more species diversity or 'richness' (Christoffel den Biggelaar, 1996). Not only the perception of 'trees' differ in Rwandan epistemology, the same goes for what is understood as 'knowledge'. Den Biggelaar and Gold (1995) describe how indigenously, in the area of agroforestry people in Rwanda are considered to be "knowledgeable" or experienced depending on the variety of tree species (or species richness) on the farm. The extensive knowledge of the traditional healer and his family and the recognition of this knowledge by community members embodies this. Den Biggelaar & Gold (1995, p. 267) also refer to how in indigenous and rural agroforestry activities, people were generally "more concerned about the fit of the whole agroforestry practice, and trees in general, into the larger landscape." This shows how in indigenous agroforestry practice materials were perceived as being part and parcel of a larger system.

Meanings

In Section 4.1 'Agroforestry & worldviews' the indigenous relation between Rwandan (Ubumuntu) philosophy and nature was introduced. As has been mentioned, trees used to have a role in proverbs and have symbolic meanings in indigenous beliefs. Moreover, an activity arising from indigenous agroforestry practice is the production of indigenous medicine. During the visit to a traditional healer and his family in Kinigi in December 2022 (near the border of Volcanoes National Park) the value of indigenous medicine for communities was brought to light. Whilst visiting their house and being shown around in their garden, we discussed how the local community heavily depends on the man, his sister and his mother for the knowledge on indigenous medicine. As will be further elaborated upon in the following sections, the profession of indigenous medicine is on the edge of becoming extinct. The resources are increasingly difficult to access. The traditional healer mentioned the profession is becoming less popular, mostly due to reasons of insufficient income generation. The traditional healer also mentioned how in tree planting interventions the importance of indigenous medicine is forgotten. These developments raise serious concerns for the family. Despite the decreasing popularity of the profession, many community members do appeal to the family for medicine on a daily basis. The role of indigenous medicine was also brought up in focus groups in which women mentioned that if they need medicine for their family, women prefer indigenous medicine for e.g. cough and stomach issues. The women even provided examples of how healthcare professionals advise them to first try indigenous medicine before going to a pharmacy for medicine. Hence, the products from native tree species are nowadays still highly valued, needed and used by community members.

The meaning of indigenous agroforestry practice goes beyond indigenous healing. One of the scientists that is actively involved in research on indigenous trees highlighted that sacred trees used to be found throughout the country (Scientist 4, Kigali, 12-12-2022). In the focus groups, this role of sacred trees came up and women referred to how their ancestors and parents valued certain species that had a specific meaning for families or the community. Related to this, these women also expressed how they found it important to take care of the land they inherited from their

(grand)parents. Even more, the women discussed how taking care of trees is central for them in taking care of their families and for the future of their (grand)children: "even though I didn't gain anything from it (*referring to growing a tree*), at least my grandson will see it and gain from it by making wood and remember that this was planted by our parents" (Focus group 1, Rwaza Parish, 10-11-2022). Another woman expressed a similar thought in mentioning how a tree has importance for her, but that she expects it to be even more valuable for her grandchildren (Focus group 3, Ruhengeri Parish, 23/11/2022). As becomes apparent through the expressions of these women, trees have an intergenerational importance. This also came up in conversations regarding the connection of trees and Ubumuntu philosophy: "If you don't have Ubumuntu, you can't plant a tree. If a person plants a tree he or she has humanity, because sometimes he or she plants without expecting to harvest if it is just for the next generation to use" (Focus group 3, Ruhengeri Parish, 23-11-2022). Kelbessa (2015) also emphasises the central role of taking care of land throughout generations. According to Kelbessa (2015), taking care of what once was (and is) the land of ancestors and leaving it behind in a healthy condition for the yet-to-be-born used to be an integral part of African philosophies.

4.2.2 Interventionist agroforestry practice

Materials

Whereas indigenous agroforestry practice thrives in 'species richness', most of the interviewees (predominantly scientists and NGO representatives) mentioned that organisations prefer to work with a selection of species that are said to be fast-growing and that either figuratively or literally provide 'low hanging fruit' to the service users of their projects. Food production and income generation from agroforestry activities are namely amongst the key objectives in tree planting interventions. The tree density in the Rwanda is increasing, yet the variety of tree species is decreasing (Scientist 2, Online, 02-11-2022). Many NGO representatives expressed similar preferences for certain species, amongst which are the exotic *Grevillea robusta*, *Alnus acuminata*, and fruit trees such as *Persea americana* (Avoca) and *Passiflora edulis* (Amatunda). Admittedly, some of these exotic species have been in Rwanda for ages and are thus also integrated into indigenous farming systems. Yet, why are exotic species so popular in tree planting interventions in Rwanda? Most NGO representatives mentioned that they regard indigenous species as slow(er)-growing. When asking follow-up questions, some participants mentioned challenges with the accessibility and production of indigenous seeds. Exotic tree species, on the other hand, are believed to be fast-growing and are generally easier to access. This seemingly makes exotic species more suitable for interventions that are expected to deliver results (e.g. prove a certain height of trees to donors) within a short time frame. Moreover, the introduction of exotic tree species could mean better short run results as natural enemies (e.g. pests and diseases) are still (relatively) absent. Adversely, in the long run, pests and diseases will become more prevalent in a possibly severe intensity (Scientist 3, Online, 24-10-2022). This 'popularity' of exotic tree species raises questions. Several interview participants expressed a knowledge gap on the potential of indigenous tree species, according to them there is need for more research on the potential of these species. Yet, amongst these participants, there seems to be the tendency to agree that indigenous tree species are less suitable in interventions than exotic species, because of growth rates and seed accessibility. Whereas all participants agree upon the latter issue, the motivation of the first can be questioned, seeing that indigenous species exist that serve similar ecological and/or income generations purposes (World Agroforestry, n.d.). Nevertheless, what is evident is that growing rates of species are determining for the integration in tree planting interventions.

Besides tree species, there are other inputs that construct the material element of interventionist agroforestry practice. The use of inputs (e.g. fertiliser, pesticides) comes with a lot of challenges for communities. Decades of intensification policies have had serious consequences for the quality of soils in Rwanda. Besides the degradation of soils through extensive input use, droughts, floods and landslides are also increasingly challenge communities' yields. Many women in the focus groups mentioned how their yields nowadays rely on the application of chemical fertilisers and pesticides.

Not only is there a high chance of their plots to become dependent on these inputs, it also causes a disbalance in the soil through which competition between soil organisms disappears and specific pests and diseases become dominant. The soils are thus less diverse and there is a higher disease pressure. This increasing disease pressure has been a much talked about issue in interviews with scientists and NGO representatives. According to an interviewed scientist in the field of biodiversity, the integration of indigenous trees and methods make up an important share in counteracting these issues. This, however, is not yet being integrated in policies and interventions. For now, through soil erosion huge quantities of (chemical) inputs and yields get lost. Furthermore, throughout the focus groups concerns were raised on unclarity regarding information on how to use these chemical inputs. Apparently, the veterinary - from which women buy their fertilisers – provides different information on the usage of these products than the sector agronomists. This becomes even more problematic when combined with how a scientist mentioned that the more the soils get depleted, the more extensive the use of chemical inputs becomes (scientist 1, Kigali, 28-10-2022). Along with the problematic (over)use of these chemical inputs are the unsatisfactory results it delivers. For example, through chemical input use, the physical appearance of the crops changes, still the inside of it remains in bad quality.

Even on a passion tree we apply chemicals, it seems ready to be harvested, but inside it is not and nothing changed" (...). "I face the same problem with tree tomatoes, sometimes the outside seems like ready to be harvested, but the inside is not. And then fruits fall down, or during that time of harvesting there is something inside… (Focus group 1, Rwaza Parish, 10-11-2022).

Notably, the women repeatedly expressed concerns regarding the influence of these chemical inputs on their health:

In these days there are diseases that are different from the diseases we had in the past. For example, many people have a high blood pressure, even children. So, if you compare that with the past you find the consequences which may be caused by chemical fertilisers (Focus group 2, Rwaza Parish, 16-11-2022).

What thus arises from the data is that interventionist agroforestry practice is relatively resource intensive compared to indigenous agroforestry practice. Even more, due to the variance in information provided on (the use of) chemical inputs, people get confused on how to use the inputs. Whereas many subsistence farmers in Rwanda depend on chemical inputs, the usage of it raises health concerns and delivers sub-optimal results.

Several NGO representatives find it concerning that, according to them, people do not use the chemical inputs effectively which affects health and nature:

They do it, because they have heard that you must protect the crop, so they spray and spray. People were taught that, but now they have become bad for the environment, biodiversity, human beings, so we must change it now. Bring the tree on the farm and strategy to control pests and diseases naturally without affecting the environment. (…) Develop something which is in the context of where you are. It is not a similar thing you can take here and implement there, it depends on the context (Scientist 1, Kigali, 28-10-2022).

Apart from the fact that interventions in Rwanda nowadays often work with a selection of exotic species that require the use of external inputs. The interventions are also carried out on a vast scale neglecting the context-specificity of agroforestry. To illustrate this, a scientist expressed how agroforestry interventions can be found throughout the entire country, even in places which may not actually be fit for these purposes (Scientist 4, Kigali, 12-12-2022). This scientist mentioned how the Eastern province is now said to become 'the breadbasket of Rwanda'. According to this scientist, this is remarkable and troublesome, as it is the Eastern province that is commonly known for its severe droughts and less fertile climate.

The scale on which these projects are carried out also have implications for how these projects involving agroforestry activities are monitored and evaluated and what technologies are used for

this. Various kinds of technologies (e.g. dashboards or applications) are rapidly developed and integrated in M&E systems of development organisations. This focus on technology shifts the attention away from human actions. When visiting websites of organisations 'involved' in tree planting activities it is likely to first find an impressive amount of trees planted by the organisation on the website. What often is lacking, is the story behind these numbers, e.g. who planted these trees? Are there, for example, disappointing survival rates? And what species are planted? An example of this focus on technology and results leading to the shifting attention from human actions is how, in the case study, it became obvious that the priorities and needs of farmers do not match the – by the organisation - preferred material outcome. Also in the design phase, I noticed how organisations do not take into account the needs and priorities of stakeholders at first. The planting of trees for firewood through the eyes of an NGO may be considered as 'contributing' to environmental problems and is probably not an as effective strategy to raise funds as tree planting for carbon sequestration. In reality, however, farming households prioritise tree planting for firewood production, because they rely on it for providing e.g. food for their families. Thus, not listening to such priorities and needs suggests that farmers have to find firewood elsewhere which in turn affects conservation efforts. Besides, for farmers growing and managing trees for firewood also means a trade-off in time previously spent on activities of collecting firewood far from their plots which can now be spent on other (agricultural) activities if integrated in the project. In the end, interventions that over-emphasise on materiality, and who do not consider the material needs and priorities of local communities will not last and are by definition not sustainable.

Competences

A returning item in this research is how the meaning and understanding of agroforestry has changed into what is now a scientific practice. When assessing skills and know-how required for this practice, questions on epistemology arise. Whose knowledge counts? Thus before diving into what skills and know-how is required in interventionist agroforestry practice, it is important to consider who in this practice is regarded 'knowledgeable'. The majority of interview participants referred to a 'knowledge gap' or mentioned how 'farmers lack knowledge'. Even during the focus groups (with 24 rural women participating of which the main income generating activity is agriculture and who could thus be considered experts by experience), some women indirectly expressed how they consider themselves to be subordinate or 'less' knowledgeable. Their dependency on the intervention seems to trickle down in a form of subordination with respect to the representatives or others involved or connected to the organisations who help or support them. It might be worth considering how hard it must be to survive as an (local) 'expert' when new species and techniques are constantly introduced exogenously.

Another hot-topic in the field of agroforestry interventions in Rwanda today is the shortage of extension agents. The following quote shows portrays how the extension system in Rwanda is embedded in almost all levels of government in Rwanda:

> *Actually the government has quite a number of extensionists. We have what we call district agronomists, district forest officers, district environmental offices. At the level of the district. (…) When you go to the lower level of the sector the government you get to the agronomists and veterinary extensionists. When you go to the lower level (cell level) we have a development officer who is supposed to do the extension as well. If you go down to the village level you have farmer promoters who are trained in the field school approach. So, they are there, but they may not be having all the capacities. But the structures are there if all is right and if the extension materials are well designed I guess things can happen* (Scientist 2, Online, 02-11-2022).

Partially depending on the design of the projects (i.e. if it is endogenously or exogenously designed) extension agents can 'make or break' projects. Noeldeke (2022) describes how, through their study on behaviour change, "if households do not have access to seedlings and knowledge, extension services can provide an alternative to deliver relevant knowledge about tree management, agroforestry, and own seedling production." In this case too, the knowledge-gap thus is a point of departure. Accordingly, this gap can be complemented by the introduction of extension services. Yet, given the assumption that farmers lack knowledge and seeing the scale on which agroforestry

(or tree planting) projects are carried out, the pressuring demand on extension agents might cause futural challenges.

In all, the design of tree planting interventions in Rwanda largely has an exogenous character. Kim et al. (2022) confirm that farmers are constantly challenged by prescribed exogenously introduced techniques legitimised by the 'knowledge gap'. According to Kim et al. (2022, p. 637), "evidence has shown that many Rwandan farmers, who employ various strategies and mixed farming practices based on their specific economic, social, and environmental circumstances, face difficulties adopting the singular prescribed approach to become more productive, modern commodity producers", which confirms that this pressure on farmers to improve their 'technologies' is thus nothing like a bolt out of the blue.

Meanings

From 1930 onwards, Belgian colonists introduced exotic species and silvicultural activities. Since the independence of Rwanda in 1962, diverse development organisations have entered the country with all sorts of projects and programmes. With agriculture being the main economic activity in Rwanda, these organisations are logically geared towards projects in agriculture or -in this case- agroforestry. The increasingly tangible effects of climate change and the reliance of Rwandan subsistence farmers on agriculture motivates organisations to step-in. These organisations intend to support farmers to strengthen their livelihoods and to adopt (mitigation or adaptation) activities. Throughout the interviews with NGO representatives, it became obvious how interesting it is for NGOs (and other organisations) to integrate tree planting in their interventions and to be able to proclaim 'greening' and 'reforestation' efforts. Whereas there are certainly good intentions at play, being involved in tree planting certainly is undoubtedly one of the most appealing funding strategies today. Interviews with various NGO representatives illustrated how agroforestry as in the interventionist practice is thus a 'tool' to achieve economical, ecological and - to an extent - social ends. This indicates that the meaning of agroforestry is constructed through some kind of utility as has also been underlined by Scherr and Muller (1990) who emphasise how agroforestry is considered as a technique to increase yields. Moreover, these techniques are subsequently developed in technology packages that apparently are a necessary good for client populations that are "neither able to diagnose, nor formulate their needs; and that they are completely incapable of devising strategies for their own development" (Christoffel den Biggelaar, 1991, p. 26).

What arises from discussing the elements that make up indigenous agroforestry practice and interventionist agroforestry practice, is that the understanding of what agroforestry entails has changed significantly. Agroforestry has gained significant scientific attention over the past decades. Interventionist actors involved are increasingly interested in, e.g. growth rates of trees, as these co-determine when organisations can present their results. Agroforestry seems to have become a commodity that needs to be commercialised in order to be successful. Yet, the definition and understanding of agroforestry differ depending on by whom it is put in use. What has originally been an indigenous practice is now increasingly portrayed as a sophisticated 'technologically improved' or 'intensification' practice.

The figure below aims to provide a transparent overview of how indigenous agroforestry practice and interventionist agroforestry practice differ. Moreover, it aims to contribute to understanding and conceptualising agroforestry as a practice. In doing so, the definitions provided in Chapter 2 'Conceptual framework' are used. Despite the clarification purposes of this table, it remains a simplification of reality in which differences or overlap are more fluid than illustrated below. Moreover, it does not show relations with other connecting practices.

p.t.o.

Table 3: Overview indigenous agroforestry practice & interventionist agroforestry practice

Elements *As based on Shove et al. (2012)*	**Indigenous agroforestry practice**	**Interventionist agroforestry practice**
Meaning Include symbolic meanings, ideas and aspirations	Valuing of and connectedness to nature and trees, intergenerationality, indigenous and spiritual connection with (sacred) trees, rituals with trees, *combined with other indigenous activities, e.g. pottery, honey collection, hunting, indigenous medicine*	Nature and trees as an exploitative matter to 'strengthen livelihoods'. Agroforestry as a commodity and as a funding strategy.
Material arrangements Things, technologies, tangible physical entities and the stuff of which objects are made	Environmental circumstances Densely forested hills, fertile soils, rain-fed agriculture Land Lower population, higher availability of land Agricultural inputs Organic fertilisers (e.g. cattle manure), organic pesticides Tree species Exotic species: *Dracaena afromontana* (Umuhati) Native species: *Acacia abyssinica* (Umunyinya); *Erythrina abyssinica* (Umuko); *Iboza riparia* (Umuravumba)	Environmental circumstances Rain- & dry seasons, extreme weather events (flooding, landslides, droughts), soil depletion, increasing disease pressure Land Population growth, decrease of land availability, increasing land claims Agricultural inputs Mixed inputs, e.g. chemical and organic fertilisers and pesticides Technologies M&E technologies (apps) Tree species Exotic species: Persea Americana (Avoca); Alnus Acuminata (Alinusi); *Passiflora Edulis*; Grevillea Robusta (Gereveriya*)*; Macadamaia Tetraphylla (Makadamia)
Competences Encompasses skill, know-how and technique	Knowledge Orally passed on through generations, based on knowledge of variety of species	Knowledge Extension agents, emphasis on scientific results

What can be retrieved from this table is that agroforestry is a contested practice. The aspects of the meaning element in indigenous agroforestry practice are expressed through the indigenous agroforestry activities that are related to and in balance with nature. In indigenous agroforestry practice, farmers combined agroforestry activities with other indigenous activities, e.g. indigenous medicine and pottery. In other words, these activities reflect the environmental ethics central to African worldviews. In indigenous agroforestry practice values and knowledge is passed on orally from generation to generation. Materials were produced locally and organically and resources were relatively less scarce and diverse (e.g. native and exotic tree species are combined in this practice). On the contrary, in interventionist agroforestry activities, farmers are often exogenously instructed (e.g. by extension services) to change their agroforestry activities into 'modern' resource intensive forms of agroforestry. Where the meaning element is leading in indigenous agroforestry practice, it is the material and competences element that are emphasised in interventionist agroforestry

practice. Species and inputs are chosen based on their potential to contribute exogenously demanded results. Tree planting interventions in Rwanda are often based on the knowledge gap of local communities maintaining the demand for extension agents and 'capacity building' to realise the adoption of what they perceive as modern and scientifically-approved techniques and technologies. In such exogenous approaches, there is limited to no room for local and indigenous knowledge, let alone activities. The valuing of trees in agroforestry practice has shifted from taking care of nature to perceiving nature and trees as tool to a priori set (economic) results (e.g. a number of trees planted).

So far the results show that agroforestry is a contested practice. We therefore need to know more about how agroforestry became the focus of development organisations. The following chapter will elaborate on this focus and on what contributed to the restricted role of indigenous agroforestry in development interventions.

4.3 The aggregation of indigenous agroforestry and interventionist agroforestry

This last results chapter dives into how agroforestry became increasingly popular amongst development organisations and what possible implications this has for the existence of indigenous agroforestry. Firstly, the relevance of integrating indigenous knowledge and activities (e.g. indigenous agroforestry practice) in interventions for biodiversity conservation is highlighted. From there, we will take a look on what prevents this crucial knowledge from being integrated into interventionist agroforestry. Hence, secondly, a question is posed on what is considered as knowledge by the involved stakeholders and what implications this has for the consultation of local communities. Thirdly, the implications of the design of projects and programmes for the inclusion of indigenous (and local) knowledge are discussed. Fourthly, the implications of (inter)national policies and strategies on indigenous agroforestry as a practice and interventionist agroforestry as a practice are discussed. Lastly, the limited integration of indigenous agroforestry as a practice in interventions is discussed.

4.3.1 Biodiversity conservation and indigenous activities

In the interviews it was brought up how indigenous activities can positively contribute to biodiversity conservation (scientist 4, Kigali, 12-12-2022). Taremwa et al. (2022, p. 205) underline this by recognising that "biodiversity conservation and nature-based solutions resulting from biodiversity, have been found to be more effective with the engagement of local or indigenous communities, many of which live adjacent to protected areas and/or have a close relationship with nature." In this approach, the communities are central to designing, implementing and managing conservation programmes seeing that, rooted in the indigenous worldview, biodiversity is valued. According to Taremwa et al. (2022), including these cultural aspects and these indigenous activities in approaches can contribute to the co-protection of it. "It is thus of great importance, in the quest to create climate change resilience, to identify current conservation practices of indigenous cultures, and which of these practices can be promoted or built upon for conservation and achievement of climate adaptation" Taremwa et al. (2022, p. 205). Rwanda scores high in indexes that provide insight into how prone or vulnerable countries are to the impact of climate change. Efforts and commitments of the Rwandese government in increasing the capacity in responding to climate change do not go unnoticed. Still, according to Taremwa et al. (2022), steps can be made in integrating indigenous knowledge systems in climate adaptation and resilience strategies. To start with this, however, understanding these indigenous knowledge systems in Rwanda is required (Scientist 4, Kigali, 12/12/2022). The question remains, however, if there room and motivation for in-depth understanding of indigenous knowledge and activities in (inter)national policies and strategies? Before answering this question, it is important to take another look on who is considered knowledgeable and what implications this has for the eventual aggregation of indigenous agroforestry practice in interventionist agroforestry practice.

4.3.2 Who is considered knowledgeable?

As previously touched upon, it is not uncommon for the Rwandan population to obey agricultural policies and guidelines set by the government. The described activities in these policies are predominantly comparable to interventionist agroforestry as a practice. This makes it even more interesting to consider the role of policy (propagated by extension agents) for the aggregation of (elements of) indigenous agroforestry practice into tree planting interventions. Throughout observations it became obvious how policies are 'received' or taken over without hesitation by organisations in the field and accordingly by people targeted by these interventions. From the focus groups, it became apparent how many farmers do not consider themselves to be 'knowledgeable' or 'an expert', despite putting forward and sharing their extensive knowledge on trees in the discussions. What also prevails is that it is not uncommon for scientists, representatives of NGOs or the government to underline the 'knowledge gap' of farmers in the design of their research, programmes and projects. Whereas policymakers thus present their knowledge and expertise as an absolute truth, they simultaneously portray indigenous knowledge and activities as suboptimal and insufficient. This indicates how power imbalances are embedded in interventions. Unfortunately, such judgments are not only presented to the farmers, they internalise it and consider themselves to be less knowledgeable compared to those designing and implementing interventions. Though, when taking a closer look it becomes clear how it is not 'better' knowledge that is introduced by these policies and interventions, it is in fact new commercial knowledge and activities that are replacing the existing ones. The following section will elaborate on the implications of such policies and underlying strategies.

4.3.3 Implications of policies & strategies

(Inter)national policies and interventions increasingly expect farmers to combine activities of e.g. conservation, climate change (adaptation), and so on. National policies are adjusted to achieve globally set goals, such as the Sustainable Development Goals (SDGs). The trickling down of these goals into national policies consequently leaves little to no room for indigenous activities and knowledge in policies. These policies are generally developed from a mainstream Western worldview, in which the natural environment is approached as a separate entity. This conflicts with the Rwandan indigenous worldview, in which a balance between the natural environment, human beings and non-human beings is pursued. In other words, the different epistemological interpretations of what entails and composes an environment in these worldviews are conflicting. Yet, it is the Western worldview that remains dominant in policies. This clearly has implications for the integration of indigenous agroforestry practice into policies and interventions. To illustrate this, in the indigenous agroforestry as a practice, the integration of indigenous tree species is crucial. However, in policies which are best comparable to the interventionist agroforestry as a practice the origin of trees is not valued as much as in indigenous agroforestry as a practice.

In national policy documents, such as the Forest Investment Program (FIP), the government does express the need for promotion of research on indigenous trees (MINILAF, 2017). Tree planting interventions today, however, show how these indigenous trees are not yet integrated into tree planting interventions, neither by the government nor by NGOs. Despite the non-application of these plans into interventions, NGO representatives repeatedly expressed their interest in integrating native trees into their programmes in interviews. Until now, however, farming households in Rwanda are still instructed to perform agricultural activities in which indigenous tree species are not included. Worse still, in policies and in the interventionist agroforestry practice, the growing of exotic species is still promoted. In Rwandan policies, income generation and the commercialisation of agricultural activities are prominently represented. In the past decades, policies have been focusing on intensification to create modern and productive producers. According to Kim et al. (2022) this dominant approach "overlooks the heterogeneity and dynamic nature of smallholder strategies". Throughout the interviews, several participants also highlighted how these processes of intensification have had a huge influence in technologies and activities that people have adopted. Clearly, these processes of intensification and specialisation are nearly opposite to indigenous agroforestry practice and require the use of even more external inputs, keeping in place a monetary

system (Entrepreneur, Kigali, 18-11-2022). The preferred tree species in such policies involve non-native fast growing (and thus 'low hanging fruit') species. As previously mentioned, throughout the interviews and focus groups participants pointed out how apparently non-native species are thought to take in fewer space on plots and how they are said to be faster growing than native species (Mukuralinda et al., 2016). Yet, not all participants agreed upon this assumption, pointing to the lack of scientific support for these ideas. "The arguments they make are fallacies, because they are always saying they grow faster, it is what the farmers prefer. I think this is apparently because whenever a farmer is giving invasive species to say you know here is X, Y and Z, choose from among them, and among them including the native species was never the case. It has always been non-native" (Scientist 4, Kigali, 12-12-2023). What is evident, on the other hand, is that policies also co-determine which seeds (and other inputs) are accessible and affordable enough for farmers to purchase and integrate into their farming systems. In these policies too, agroforestry is approached as a purely technical intervention, whereas this does not provide a holistic perspective on the issue. Policies and accordingly these interventions are influenced by external donors and commercial stakeholders introducing these adjusted materials, competences and thus the practice. Hence, seeds that are not considered to be contributing to economic systems (e.g. are not profitable) on a household level, become more expensive and less easy to access (Scientist 4, Kigali, 12-12-2022; Entrepreneur, Kigali, 18-11-2022). This (and the difficulty in propagating and regenerating them) insinuates the current status of indigenous trees on farms and how these are in fact at risk of extinction (Mukuralinda et al., 2016).

4.3.4 What restricts aggregation?

Despite a growing interest in Rwanda in research on indigenous trees, from the observations and in interviews it became clear how some development organisations seem to take on a wait-and-see attitude for scientific results and evidence on which trees to include in their interventions. This would, accordingly, impede the practice of shifting towards more indigenous approaches of agroforestry, as it involves different inputs and perhaps - in the case of reintroducing - indigenous species also more specific know-how on the growing of these species. Seeing the significant shortage of extension agents in the past decades, this could be challenging and will thus not be the likeliest path to choose for organisations. The question is thus not only if the organisations are in fact waiting for scientific substantiation (which would notably be more respected with a quantitative character) to change their interventions, it is also important to question the motivation of organisations to choose for a - what they believe- is a more time-consuming or less profitable path. Besides, from the case study it also became clear how these organisations rely on the networks in which they are embedded. Both governmental and non-governmental organisations in Rwanda find themselves in different networks. Organisations are for example brought together in platforms such as NINGO (the network of international NGOs) and thematic working groups. Such networks contribute to the coordination of interventions and to the coherence of these interventions with (national) policies. Accordingly, it also leads to forms of dependency. One of the scientists brought up how a leading organisation in Rwanda (accounting for e.g. 20 million trees per year) integrates (and thus promotes) fast growing non-native tree species and make recommendations regarding the use of 'modern' inputs (e.g. chemical fertilisers and pesticides) and technologies, other organisations tend to copy these designs (Scientist 3, Kigali, 07-11-2022).

This dependency of NGOs on other (bigger) NGOs is worrying according to the biodiversity experts that participated in this study. These experts namely emphasise the importance of the indigenous agroforestry practice and the pitfalls of the interventionist agroforestry practice. "Farmers are really adopting trees. (...) Yes we are increasing the density on farms, but the diversity is decreasing. If we have, let's say Erythrina Abyssinica, and all the Ficus species. These are disappearing from the landscapes as a consequence of low awareness of the values and people tend to think they are doing it in a modern way when planting exotic species" (Scientist 2, Online, 02-11-2022). The over-emphasis on such species that require the use of external inputs and techniques may negatively impact the proneness of trees to pests and diseases whilst possibly also endangering biodiversity conservation.

This scientist also highlighted how the new generation has been absent in the transition to know and understand the value of indigenous trees. "They would look at trees and notice how the trees do not grow straight wood, concluding that it is not suitable for the building of e.g. houses. Eventually ending up choosing exotic species that do fit these requirements. Unfortunately, other functions of trees get neglected in such observations, such as the medicinal use of trees." Hence, throughout the years a gap has developed between indigenous agroforestry as a practice and interventionist agroforestry as a practice. The traditional healer consulted in this study indicated how NGOs (possibly unintendedly) contribute to maintaining or widening this gap by making it increasingly difficult for people in communities to preserve indigenous agroforestry activities:

What we could ask projects, since they are bringing the other seedlings, they can also include seedlings of medicinal trees, maybe they can come to us who are doing indigenous practice and then ask us which types of trees that we want instead of going and bringing trees that sometimes we don't even need. Because there are trees which have disappeared, to find them we have to go to Nyungwe. So if they are able to bring those trees, we are the one who can give them information that would be helpful whenever we can plant it together with what we already have. There are some trees that have disappeared here, but are still in Nyungwe or Akagera. Maybe if the project comes and we tell them which trees would be needed, they can bring those trees to us. That would be very helpful" (Traditional healer, Kinigi, 14-12-2022).

Unfortunately, as described in Textbox 1 below, a tunnel vision on interventionist agroforestry activities also has a side-lining effect on other indigenous activities, such as pottery:

On the 12th of November 2022, I joined 100WEEK in a field visit to some of the women groups that are living in Rusizi District (i.e. Southern Rwanda, close to Nyungwe National Park). After a 60 minute drive from the main road, we reached the village where we met the women groups. These women live remotely, in poorly maintained houses that were assigned to them by the government. No doors, no windows, hardly any furniture. It certainly crossed my mind how marginalised these women live, seeing the conditions and the fact that they were assigned to this village and houses within this extremely remote area. During the visit we spoke to the women and asked them about their livelihoods and if they experienced changes since the beginning of the 100WEEKS programme. The women proudly shared how the project enabled them to purchase a piece of land or cattle. Whilst visiting some of the houses of these women, we noticed that many of the women were practicing pottery activities. This was perceived as problematic by staff of the organisation.(…). Eventually the women were instructed to (partially) replace this traditional activity by income generating activities. This was an eye-opening experience as this activity clearly was of importance to all the women (every one of them had the pots in their houses), but not all the NGO staff understood this importance and had the opinion that it was troublesome or even a waste of time. Despite the undoubtedly good intentions, this underlines how traditional activities are perceived as 'primitive' for lacking economic value.

Textbox 1: Fieldnotes of field visit November 12th 2022, Rusizi District.

4.3.5 Improving the integration of indigenous agroforestry in tree planting interventions

Organisations rapidly launching tree planting projects, such as in this case 100WEEKS, copy and apply interventionist agroforestry activities. This is how development organisations introduce alternative technologies that are not always tailored to the values and needs of local communities and that do certainly do not fit the indigenous agroforestry practice. The traditional healer and his family brought up such needs, e.g. making indigenous seeds more accessible and promoting indigenous medicine. This would benefit the community as a whole, co-protecting indigenous knowledge and contributing to biodiversity conservation. What arises from this, is the need for a shift from exogenous development approaches in tree planting interventions to endogenously driven interventions. Jacobi et al. (2017, p. 474). confirm this: "Agricultural and development projects that effectively integrate external and local forms of knowledge can only be maintained and scaled up if

they are embedded in supportive networks and backed by an integrative epistemological framework that takes into account the various dimensions of sustainability". The differences in the elements of indigenous agroforestry practice and interventionist agroforestry practice bring to light what interventions could change to better aggregate indigenous agroforestry and interventionist agroforestry and to overcome the paradox of the popularity of tree planting interventions in which sustainability is compromised by the use of exogenous techniques and external (chemical) inputs.

Firstly, centralising the 'knowledge gap' of farmers in interventions seems to generate a sense of legitimacy amongst organisations involved in these interventions to introduce 'improved' technologies. This point of departure is one of the areas which is determining for the exclusion of indigenous knowledge and agroforestry activities in interventions. Secondly, this 'insufficiency' in the competences element that legitimises the introduction of materials that are said to contribute to socio-economic and ecological ends, e.g. strengthening livelihoods. From the interviews, however, it has become clear that this could also be done whilst integrating material aspects (of elements) of the indigenous agroforestry as a practice. There are indigenous tree species that are evenly suitable for these purposes and that can deliver the similar products and ecological services to exotic species. Thirdly, when it comes to the meaning element, a shift has occurred towards perceiving nature as a tool and hence as an exploitative matter. From this point of view, agroforestry activities nowadays have to contribute to a form of economic utility. Therefore, other indigenous activities are side-lined, whereas these may be valuable to the indigenous culture. Integrating indigenous values into interventions protects not only indigenous knowledge itself, but also nature. The indigenous worldview in which, e.g. a balance between production and preservation is pursuit, is not sufficiently considered in tree planting interventions, whereas this could counter-balance the economic character of interventionist agroforestry as a practice. Moreover, the integration of it in interventions would not only support in protecting nature, it would also help preventing indigenous agroforestry as a practice from becoming extinct.

5. DISCUSSION

This chapter elaborates on the interpretations and explanations of the results in this study, starting with briefly touching upon the research problem and major findings. Secondly, the interpretation of the data and results will be discussed upon. Thirdly, the implications of the study are brought to the fore. Fourthly, the limitations of this research will be discussed. Lastly, recommendations for practical implementation and concrete suggestions for future research are shared.

Central to this study is the research problem (see Section 1.1 'Problem statement & research outline') stating that the rapid launching of tree planting interventions has implications for the existence of indigenous knowledge and activities. Amongst the major finding of this study is how 'modern' agroforestry activities are introduced by (non)governmental organisations under the guise of the knowledge-gap of communities and a lack of resources. This lack of resources is an indication of the development of competing claims (e.g. on land) which further marginalises local communities, who tend to internalise the idea of this knowledge-gap. Generally speaking, tree planting interventions in Rwanda fit the dominant economic development pursuit of the country. From this perspective, agroforestry practice becomes a tool for economic development. Indigenous knowledge and activities are insufficiently considered or consulted and regarded as unprofitable in exogenously introduced tree planting interventions. Eventually, 'modern' activities are proposed and introduced that overrun and undervalue existing forms of knowledge and activities. Therefore, tree planting interventions risk contributing to the extinction of indigenous knowledge and activities. This can be detrimental seeing the fact that indigenous knowledge and activities have a rich history of biodiversity conservation by e.g. the integration of indigenous tree species.

From the start, I interpreted the size and pace in which these 'reforestation' and 'greening' interventions are rolled out in Rwanda as problematic and as pressuring local communities. Though, from a mainstream worldview this might not be a popular way of seeing it. In most conversations I had regarding these interventions, people were enthusiastic and optimistic about the developments in the country. From the start I had my questions on the consultation of local communities prior to these interventions. I expected the enthusiasm to cause blind spots. The design and implementation of interventions must involve the thorough consulting and involving of local communities, also for the sustainability of the intervention. From the analysis, however, it became apparent that this thorough consultation is often an exception rather than the rule. The analysis shows that communities tend to take on recommendations of (non)governmental organisations without hesitation and internalise the idea of the 'knowledge-gap'. Whereas I did not expect communities to internalise this in this extent, it in fact worsens the expectation I had regarding the existence of indigenous knowledge and activities and how this is influenced by the design and implementation of tree planting interventions. Seeing the cruciality of indigenous knowledge and activities for biodiversity conservation (Taremwa et al., 2022), the promotion of exotic tree species and external (chemical) input use in policies and in interventionist agroforestry practice is surprising. It does, however, fit into a broader dynamic of a dominant role of the Western worldview and (scientific) knowledge in development.

This brings us to the implications and relevance of this study. Placing this issue within the broader dynamic of the dominance of Western scientific knowledge, namely shows the potential of developments such as these tree planting interventions to contribute to the undervaluing of other worldviews (Jacobi et al., 2017) and how this is often rooted and connected to broader societal structures. Something that illustrates this is the removal of indigenous activities in the introduced Western curriculum that, up until today, is dominant in Rwandan education systems. Throughout my stay in Rwanda I often got confronted in conversations with Rwandans on how Rwandan students have been taught about European history and how, Western students visiting Rwanda, often did not receive any education on African history. Since the emergence of this Western (science based) educational system, there is less room in the curriculum for indigenous agricultural activities and beliefs. According to Jacobi et al. (2017, p. 473) "This can be considered a global phenomenon, as scientists worldwide have usually supported exogenous over endogenous approaches". Jacobi et al.

also mention the tendency of scientists to focus on well-performing species and to accordingly limit plant trials for agro(forestry) known species. Subsequently, scientists leave little room for local - culturally anchored – activities that have proven to be sustainable over centuries. Noticeably, the education system contributes to how people view the world and what they regard as 'knowledge' (i.e. epistemology). In development interventions, agroforestry projects are often delivered in technology packages, referring to the 'expert approach' and can thus be seen as an exogenous (i.e. top-down) development approach (Scherr & Muller, 1990). These packages are then presented to farmers for whom it is (either directly or indirectly) assumed that they lack certain knowledge and who are supposed to implement them. The fact that in tree planting interventions, these packages only entail seedlings with an exotic origin often requiring external input use, is one such example embodying the presumed hegemony of Western scientific knowledge (e.g. on growth rates of exotic species) and how this presumed hegemony is rooted in agricultural development interventions.

The theory on which this study builds is only one of the available theories on social practice. This comes with implications for the data collection and analysis. For this study, however, Shove's et al. (2012) theory on social practice is leading. Clearly, choices were made as a consequence of amongst others time constraints and for coherence reasons. This theory was chosen as they provide social practice theory in a relatively demarcated (and therefore applicable) manner. The application of the academic context and the description of the elements as by Shove et al. (2012) has nevertheless been subject to my interpretation. Whereas this study does by no means claims to provide an exhaustive and detailed explanation of how agroforestry is interpreted from a practice lens, it does give a clear impression of how, for example, worldviews relate to agroforestry practice. Whilst the distinction of indigenous agroforestry practice and interventionist agroforestry practice does reveal that agroforestry is a contested practice, this distinction is not exhaustive and remains a result of the interpretation of the collected data. Nevertheless, the results do provide insights such as how the meaning and understanding of agroforestry through different worldviews differs significantly. Yet, there is always more data to be found on this topic than has been consulted for this study. Additionally, the findings depend on the insights shared by the participants consulted in this study, whereas there are more stakeholders in the field of agroforestry interventions in Rwanda who potentially have other perspectives on the matter. As previously touched upon however, jumping into the conclusion that this single case-study is not generalisable underestimates the potential of the case-study to add to an ongoing broader dynamic of research in this field (e.g. in the marginalisation of indigenous knowledge in exogenous development interventions). Moreover, and as arising from the analysis, social sciences seem to be generally less respected in Rwanda. It has therefore been challenging, relevant and interesting to conduct this case-study in Rwanda. There has not been a lot of research from this perspective geographically covering Rwanda and thematically diving into agroforestry, certainly not from a social practice theory lens. This study provides a different perspective to the existing research on agroforestry in Rwanda which thus usually has a more quantitative character. Considering my social background, the insights of this research might not fit the dominant approach in this field and the research conducted on agroforestry this far. That is why, also in other geographical contexts, it is necessary to investigate and question tree planting projects and the implications it has on the existence of indigenous knowledge and activities. Thus, looking beyond the seemingly good intentions of tree planting projects and the numbers and results it promises, is crucial. Approaching tree planting interventions from different (trans)disciplinary perspectives may help to build bridges and to integrate indigenous perspectives in the design of these interventions.

In all, we should stay critical and keep asking ourselves questions, e.g. who are the people behind these interventions (instead of how many trees can we plant)? What are the purposes of tree planting interventions? And are local communities the ones who should change their (indigenous) activities in this fight against climate change? Without thoroughly considering the consequences this has for communities and their indigenous activities, the potential of tree planting interventions to harm local communities should not be underestimated. For this reason, I hope this research contributes to a larger stream of research emphasising the importance of (reintegrating) indigenous knowledge and activities into interventions. Fortunately, steps are being made, such as the 'Interactive Suitable

Tree Species Selection and Management Tool for East Africa' that has been developed to promote tree diversity on farms and landscapes, also including indigenous species. Recommendations for future research would include investigating how to integrate these species in tree planting interventions whilst simultaneously paying attention to the value of these indigenous species and the corresponding activities. Another recommendation would include doing research on indigenous trees that are still present in the Rwandan landscape (outside of the parks) and conducting information on what has contributed to the existence and survival of these trees (both culturally and ecologically). Moreover, conducting further research on the relation between agroforestry and African environmental ethics could bring to a light the potential of including these norms and values and lead to the promotion and eventual integration of it in tree planting interventions.

6. CONCLUSION

Tree planting interventions are carried out on a large scale throughout Rwanda. Whereas agroforestry is an ancient indigenous practice, the kind of agroforestry practice that underlies these tree planting interventions differs significantly from the indigenous practice. Forthcoming from the research question 'What are (indigenous) agroforestry practices in Rwanda and what role do they have in tree planting interventions?', this study distinguished indigenous agroforestry practice and interventionist agroforestry practice. The often exogenously introduced tree planting interventions are embedded in a mainstream Western worldview striving for economic and ecological change. From this worldview, agroforestry has almost become a commodity and is used as a tool for economic and ecological purposes through which organisations can claim to contribute to 'greening' and 'reforestation' in Rwanda. Increasingly, these claims are part of NGOs' funding strategies as tree planting is now one of the themes that help these organisations qualify for enormous funding budgets. Under the guise of 'livelihood strengthening', communities are targeted by these interventions in which new techniques and activities are introduced that are focused around the materials and competences elements, e.g. external inputs and extension services. Remarkably, it is communities that are perceived to lack knowledge for these exogenously introduced agroforestry practice. It is almost as if claiming this 'knowledge gap' justifies the introduction of this practice.

NGOs are not the only party involved in these interventions. The Rwandan government simultaneously launches various tree planting interventions in the country. Not only are NGOs and the Rwandese government convinced that communities lack knowledge to integrate modern agroforestry techniques, there seems to be a tendency among community members to perceive themselves as being less knowledgeable. This is worrisome for several reasons. Firstly, Rwandan farmers involved in agroforestry activities take over government policies (e.g. through the work of extension agents) without hesitation. This also goes for NGOs who introduce agroforestry techniques (often in line with these policies) that involve a handful of popular fast-growing exotic species and external inputs. Subsequently, the ecological environments - which are crucial for farmers to provide for the needs of their family - are changing. Whereas development organisations have good intentions with the launching of tree planting interventions, the soils are in fact still depleting and eroding and are increasingly dependent on the use of external inputs such as chemical fertilisers and pesticides. Hence, as long as tree planting interventions promote exotic species and the use of chemical fertiliser not much will change in the long run. Secondly, these exogenous processes contribute to the extinction of indigenous agroforestry that does not overly rely on external inputs and exotic tree species. Adversely, indigenous agroforestry practice is less resource intensive and include indigenous tree species. These developments certainly pose risks for biodiversity witnessing the changing ecological conditions in the landscape. Moreover, indigenous agroforestry knowledge and activities are undervalued and threatened to become extinct, whereas the worldview in which these indigenous knowledge is embedded contributes to the protection and conservation of nature and thus biodiversity. Therefore, development organisations that are or are eager to be involved in the trend of tree planting, should consider integrating indigenous knowledge and activities and move beyond the concept of interventionist agroforestry practice. Nevertheless, up until today, the Western mainstream worldview is dominant in these interventions and nature is perceived as an exploitative matter. In the vast majority of interventions, there is no role for indigenous agroforestry and agroforestry is predominantly considered and used as a tool to deliver economic outputs.

In all, agroforestry is understood differently in the indigenous agroforestry practice and in interventionist agroforestry practice. Whereas 'meaning' (e.g. beliefs, proverbs, traditions) has a central role in the indigenous agroforestry practice, agroforestry in tree planting interventions is more geared to the introduction of new and 'improved' technologies. As long as indigenous agroforestry as a practice is perceived as less valuable, backward or stagnant, it is not likely that this practice will be included in futural tree planting interventions, which may unfortunately contribute to the extinction of indigenous practices and species. In the end, not integrating indigenous agroforestry paradoxically compromises the sustainability of tree planting interventions.

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8. APPENDICES

Appendix I: Topic guides

I.I - Example of interview topic guide

1. *Introduction*

- *Informed consent*
- *Recording for research purpose only*
- *In case you do not want to answer a question, please let me know. In case you want to elaborate on something or add something, feel free to do so.*
- *Before using the actual data from the interview, I will contact you prior to it for confirmation.*

2. Research Center (pseudonym)

- Could you tell me something about your (academic background)?
- Why did you start working for the […]?
- What are the strengths of this centre?
- Why is the […] so important and what can it contribute to Rwanda's forestry future?

3. Rwanda

- What are the main challenges for Rwanda when it comes to agriculture?
- What are the main challenges for Rwanda when it comes to agroforestry?
- What has changed in Rwanda over time when it comes to tree planting according to you? (species, practices, methods, accessibility, resources).
- To what extent do you think exotic species may pose a threat to Rwanda's future? From a socio-economical and sustainability perspective?
- What are the biggest challenges for farmers when it comes to agroforestry?

4. Interventions

- Do you think agroforestry interventions (e.g. from NGOs) help Rwandan farmers? On a short/ long run? Why / why not?
- Do you think organisations (or the government) in Rwanda that are involved in tree planting are implementing projects that will be effective for the long run too?
- What, according to you, are the biggest challenges (or opportunities) for such organisations?
- Do you think Rwandan farmers are consulted enough on their knowledge and priorities in agroforestry/agricultural projects?

5. indigenous knowledge

- Could you tell me about the current research that you are carrying out regarding indigenous knowledge of farmers?
- What motivates this research?
- Do you think there is a distinction possible between indigenous and non-indigenous agroforestry practices (or knowledge) in Rwanda? How would you describe it?
- What, according to you, are the main factors that contributed to the loss of indigenous knowledge in Rwanda?
- Could indigenous knowledge (on trees) be beneficial for future sustainability objectives? Could it be combined with current practices?
- How would you describe the knowledge of farmers on agroforestry / trees and would you speak of a knowledge gap?

6. Worldview

- How would you describe your own worldview?
- Do you think the worldview of Rwandan farmers is different from yours, in what ways?

- Are you familiar with ubumuntu philosophy? Do you think that is still relevant in the daily lives of farmers?
- Would you think tree planting interventions should pay (more) attention to the worldview of 'the beneficiaries'? Why or why not?

7. Trees

- Do you think indigenous tree species are more linked to (require) indigenous knowledge? Why / why not?
- In what ways are indigenous tree species important for Rwanda's future?
- Are there tree species (used by farmers) that are threatening the biodiversity in Rwanda? In what ways?
- Do you think agroforestry by farmers on a smaller scale has an effect on the micro climate?

8. Do you have any questions you wish to elaborate on or any other suggestions?

I.II - Example of focus group topic guide

In Italics: Instructions for moderator

Regular: Questions to address

	Main questions Need to figure out: what are agroforestry practices (meanings, materials and skills) that the women are involved in? *Identify priorities in tree growing.*	**Possible follow-up questions**
1	What does a day in the life of these women look like? What activities do you do?	1. What did a day in your life look like 3 years ago? 2. Which agricultural activities are part of the day? 3. How did you learn how to carry out these activities? Who taught you?
2	What are the priorities of the women? *(May be unrelated to the project as well!)*	1. What is most important for your household in daily life to be able to sustain yourself? 2. What are the biggest risks for the sustenance of your household? 3. Are there things that your household cannot live without? 4. What are the most challenging things for your household?
3	Could you describe your farming practices?	1. What are the most important trees for your household? And why? *Explain for each tree they mention.* 2. What kind of tree varieties do you grow? *Can they describe main characteristics and uses?* 3. Do you grow trees that have a special meaning to you? 4. In your youth, did your family grow trees that have a special meaning? 5. Are there differences amongst the women in the group in how they farm? 5. Who do you get most knowledge from on how to farm the trees you have today? Explain what knowledge/skills. 6. Do you use different tree varieties than before (e.g. 5 years ago?) 7. Are there trees or varieties you would like to get but cannot access? What are these? Why can't you access it? 8. Are there trees you are sorry to have lost? Why are you sorry? 9. Are they concerned about losing diversity of trees/crops? 10. What are the main stresses (particularly pests and disease) their production is subject to?

		11. Do they apply chemicals to cope or prevent these stresses? What kind of chemicals? 12. Do they apply organic matter? 13. Are they concerned about the effects of pesticides on their health, soil, groundwater, crops? 14. How have they learned these things? And how do they get information about pesticides and diseases? 15. How does the use of chemicals or organic matter change their yields?
4	What changes do you see on your land/plot?	1. How would you describe the quality of the soil on your plot? 2. Do you see changes in the fertility of your land compared to 10 years ago? 2. Do you see differences in rainfall patterns? 3. What differences do you see in the dry season? 4. Did your land experience flooding / landslides? 5. Do you have any sort of land or soil erosion concern? 6. Do they apply any practice to avoid or prevent it? What kind of practice? Is it individual or communal?
5	Can you describe how you got knowledge on trees?	1. What have you learned from previous generations about trees? 2. Who taught you these lessons? 3. What did trees mean for your ancestors? 4. What do trees mean in your life? Which tree species? 5. To whom and how will you pass the knowledge and meaning of these trees? 6. Are you familiar with 'ubumuntu'? 7. Are trees important in 'ubumuntu' according to you? In what ways? And which trees?
6	What has changed since the tree planting intervention?	1. Did the organisation consult you on your priorities before the tree planting project? 2. Did they ask you what you know about trees before you got the seeds? 3. Did they ask you which species would help you best? 4. How do you take care / maintain the trees? 5. How did you take care / maintain trees before the project? What is different? 6. Are there new activities in your daily life now that you have these seedlings?

Appendix II: Coding structure

Category	Subcategories	Explanation of subcategories	Codes (as used in ATLAS.ti)
Social practice theory	Materials	Including things, technologies, tangible physical entities and the stuff of which objects are made" (Shove et al., 2012, p. 14).	Agricultural inputs; species; natural environment; biodiversity; natural circumstances
	Meaning	In which we include symbolic meanings, ideas and aspirations" (Shove et al., 2012, p. 14).	Community; importance; priorities/needs; indigenous knowledge
	Competences	"Which encompasses skill, know-how and technique" (Shove et al., 2012, p. 14).	Awareness; Capacity building; expertise
Endogenous / exogenous development approach	Endogenous development approach	The exogenous development approach literally indicates 'coming from without', and can be considered a top-down approach. In exogenous development, "the dominant development priority has been economic growth as opposed to livelihoods and social/human development" (Holcombe, 2014, p. 750).	Reintroducing traditional practices; promoting indigenous species
	Exogenous development approach	"Endogenous development is development that is based mainly, though not exclusively, on local strategies, knowledge, institutions and resources. It involves a continuous process of adaptation and innovation, starting from within the local community. It implies working with people instead of working for them" (ETC Compas, n.d. , p.6).	'Improving' practices; innovative agroforestry; funding; government ; greening; instructions; behaviour; rules; organisation
Other			Agency; spatial developments; temporal developments; experience; design/implementation/M&E

Appendix III: Consent form focus groups

Please note: this document has been translated in Kinyarwanda and has been explained prior to the start of the focus groups.

Dear participant,

First of all I want to thank you for this opportunity. Let's hope together we can gather useful insights to make interventions fit even better in the local context.

With this form, I am asking you for permission to record the meeting and use the data for my research. The aim of the research is to gain insight on tree planting interventions in Rwanda and to see what role there is for both local and indigenous and new ways of agroforestry.

I encourage you to share your experiences as they are valuable for this research. You are the ones who are planting the trees. So please remember: you are the expert!

The data will be handled with care and discretion. Could you please write for me your name, age and signature in the table below to give your permission to record the meeting and use the data?

	Name	Age	Signature
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			