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PhD Thesis

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Reproducing Forestry

Education, Scientific Authority, and Management Practices in Tanzania

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Cover Photo: A signboard at the main gate of the Forestry Training Institute OlMotonyi, Arusha, Tanzania
Photo credit: Eliezeri Sungusia

Abstract

Despite changing views about what forests are and what values they hold to society, the narrow vision of scientific forestry emphasizing demarcation, mensuration, calculation, and modelling remains hegemonic across most of the World, including in Tanzania. The reproduction of forestry across time and space is the topic of this thesis.

The thesis considers the reproduction by conceptualizing forestry practices as a product of dispositions (habitus) and encountered situations within the forest management social field. The thesis links the production, circulation, and application of scientific forestry knowledge. Employing a qualitative methodology based on interviews, observations, and document analysis, the thesis thus examines the reproduction of forestry in educative practices at the Sokoine University of Agriculture (SUA), activities of forestry academics, and practices of government foresters.

The pedagogy and curriculum of forestry education creates scientific forestry habitus for the forest management field. Forestry academics, who doubles as scientists and experts and occasionally as bureaucrats, conduct research and engage in consultancies in ways that preserve and perpetuate, rather than disrupt, the primacy of scientific forestry knowledge, consciously or unconsciously. Professional foresters' habitus, acquired through forestry training, imply that technical practices are taken for granted. This is not to deny that foresters undertake strategic actions to maximize their personal benefits. But even so, the scientific forestry habitus predisposes foresters to reproduce technical forestry practices.

Violence (injustices and failures) in forest management is thus a by-product of what appears to foresters as appropriate forest management approaches and practices. Violence is symbolic and often misrecognized because foresters have acquired a frame of seeing and thinking about landscapes with trees that naturalizes scientific forestry practices. This misrecognition of violence and failures reproduces existing practices by foreclosing the possibilities of seeing beyond and disrupting them. A radical rethinking of forest policy, and thus of the established scientific and social order, therefore presupposes a rethinking of the forestry curriculum and pedagogy.

Resumé

Samfundets ønsker til skove er foranderlige i tid og sted. Trods det har skovbrug som videnskabelig og erhvervsmæssig tradition har fastholdt en snæver forståelse som bygger på adskillelse af skove fra det resterende landskab og kvantificering og modellering af træproduktion. Denne forståelse er fortsat den dominerende, også i Tanzania. Denne afhandlings emne er reproduktionen af denne forståelse og – dermed – den eksisterende videnskabelige og sociale orden.

Reproduktionen af den skovbrugsfaglige forståelse analyseres via dispositioner, eller vaner, (habitus) som tilegnes i uddannelse og socialisering i daglig praksis blandt skovforvaltere. Afhandlingen skaber dermed en forbindelse mellem produktion, cirkulation, og anvendelse af videnskabelige tilgange til skovforvaltning som de optræder i skovbrugsuddannelse og -forskning på Sokoine University of Agriculture, Morogoro, Tanzania og i forvaltningspraksis i Tanzania mere generelt. Dette baseres på kvalitativ metode omfattende interview, observationer og dokumentanalyse.

Afhandlingen viser hvordan den skovbrugsfaglige habitus skabes i et samspil mellem pædagogik og pensum i skovbrugsuddannelsen. Uddannelsen medvirker til at skabe en forståelse af skovbrug som et teknisk – fremfor politisk – anliggende. Uddannelsen af skovforvaltere tillader dem ikke at stille spørgsmålstegn ved den eksisterende viden, som de derfor ender med at reproducere uanset om det er i deres umiddelbare egeninteresse eller ej.

Den eksisterende forståelse af skovbrug bevares fordi underviserne, fremfor at forske, i højere grad optræder som eksperter og konsulenter, eller udpeges til ledende stillinger i ministerier og styrelser. Dermed fratages underviserne mulighed for at tænke udenfor de givne rammer for hvad skovbrug er og kan være.

Konsekvenserne af den dominerende forståelse blandt skovforvaltere er symbolsk vold, idet forvaltningspraksisser som reproducerer ulighed og slår fejl (i forhold til de målsætninger som er opsat) videreføres og anses som legitime af både skovforvaltere og lokale brugere af skovene. Den ureflekterede opbakning til eksisterende praksisser og tilgange til skovbrug udelukker forandring. Man kan derfor ikke forestille sig en grundlæggende gentænkning af skovforvaltningen – og dermed den eksisterende videnskabelige og sociale orden – uden en forudgående forandring af pædagogik og pensum i skovbrugsuddannelsen.

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Acronyms

CBFM	Community-Based Forest Management
CIFOR	Center for International Forestry Research
DANIDA	Danish International Development Agency
DFO	District Forest Officer
DFO	District Forest Officer (Local Government Authority employee)
DFM	District Forest Manager (TFS employee)
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FBD	Forest and Beekeeping Division
FMP	Forest Management Plan
FTI	Forestry Training Institute, Olmotonyi
FZS	Frankfurt Zoological Society
GIS	Geographic Information System
GTZ	German International Development Agency
ITA	International Technical Adviser
IUCN	The International Conservation Union
JFM	Joint Forest Management
JMA	Joint Management Agreement
KILORWEMP	Kilombero and Lower Rufiji Wetlands Ecosystem Management Project
LAFR	Local Authority Forest Reserve
MCDI	Mpingo Conservation and Development Initiative
NAFORMA	National Forest Resource Monitoring and Assessment
NFBKP	National Forest and Beekeeping Programme
NORAD	Norwegian International Development Agency
NTA	National Technical Adviser
NTFP	Non-Timber Forest Products
PFM	Participatory Forest Management
PFRA	Participatory Forest Resource Assessment
REDD	Reducing Deforestation and forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
SIDA	Swedish International Development Agency
SUA	Sokoine University of Agriculture
TFS	Tanzania Forest Service Agency
TROFIDA	The Development of Tropical Forest Inventory Data Analysis Package

UNEP	United Nations Environment Programme
URT	United Republic of Tanzania
VLFR	Village Land Forest Reserve
WMA	Wildlife Management Area
WWF	World Wide Fund for Nature

Chapter 1: Introduction, Justification, and Objectives

1.1 Introduction

Professional foresters construe of landscapes with trees in a particular way. Where such landscapes may signify hunting grounds, burial places, grazing areas, or a place of beauty and recreation for different people, foresters often visualise people-less forests that are spatially organized in which trees are measured and growth rates modelled to calculate sustainable yields. This particular way arose in the 18th century in Central Europe and has since travelled across the globe imbuing foresters with exceptionally similar ways of thinking about and practicing forestry. Being the instruments of states, foresters have been able to impose their view on forests and peoples' relations to these forests at least in areas where the state is present. The idea of forestry has had a wider reach, colonizing the minds of non-foresters as well. This has happened despite failures (see e.g. Hansen & Lund, 2017; Langston, 1995; Mathews, 2011; Schabel, 1990; Scott, 1998) and changing ideas about what forests are and what values they hold to society (Chazdon et al., 2016). The reproduction of forestry is the topic of this thesis, seeking to understand how it is achieved despite contradictions and failures.

This thesis considers the preoccupation with and the universality of scientific (technical) forestry rife in Tanzania's forest management field. This is important because scientific forestry principles are not always relevant to the task of forest management and do not always produce the intended results. The many different types of forest, management objectives, arrangements, and contexts (social, cultural, economic, ecological) challenge the universality of scientific forestry. Yet, scientific forestry ideas and approaches are dominating the management of plantation of fast growing exotic species as well as natural forests of slow growing native species which occupy 44 million ha out of 48.1 million ha of forest and woodlands in mainland Tanzania (URT, 2015). These ideas also dominate state-led forestry epitomized by government forest reserves as well as schemes meant to transfer power over forests to local communities (villagers) through decentralization of forest management.

The thesis seeks to understand why and how scientific forestry ideas and approaches are so entrenched in the forest management field. The thesis draws attention to the mechanisms of reproducing the primacy of scientific forestry knowledge. This reproduction happens through multiple mechanisms including legitimate (and naturalized) pedagogic actions that work to mould a professional forester who is very likely to produce scientific forestry practices. Reproduction of forestry is examined by focusing on Participatory Forest Management (PFM)

in natural forests. This can be seen as a critical case because if foresters are unable to rethink scientific forestry in the context of community-based forest management (CBFM) for natural forests, it could be expected that they won't be able to do so in any other context. Given that CBFM is explicitly about participation and takes place in multiple-use natural forests, one would imagine that it is in this context – if ever – that foresters will rethink the concept of scientific forestry. It is thus a good case to test just how strongly foresters hold on to the concept.

Over the past 40 years, an estimated 732 million hectares of forests across 62 countries – covering 28% of the forest estate in these countries - were put under some forms of decentralized forest management regime (FAO, 2016). So far, decentralization has struggled to live up to its promises. As we will see in this thesis, technical framing of participatory forestry is significantly responsible (FAO, 2016; Ribot, 2002; Ribot, Agrawal, & Larson, 2006).

Tanzania is one of the countries that has been decentralizing different domains of government. In the forest sector, decentralization arrived in the form of participatory forest management – a policy aimed at increasing the participation of non-state actors, notably villagers, in forest management. Two approaches are provided for in the policy. The first is joint forest management (JFM), a co-management arrangement for managing government-owned forests in which a joint management agreement (JMA) is entered into between the government and local communities (URT, 1998). The second approach is CBFM – an arrangement allowing local communities to establish and manage village land forest reserves (VLFRs) in which 100% of financial benefits generated from sustainable utilization of forest resources in the reserve is retained (URT, 1998). The legal requirements for the transfer of forest ownership, management responsibilities, and rights to retain forest revenues to villages include certificate of registration of a village, village land use plan, a forest management plan with associated maps and bylaws for enforcing the plan.[1,2] Forest harvesting requires a harvesting plan based on the detailed inventories specifying the sustainable levels of offtake (allowable cut) (URT, 2013). Through increased participation of local communities in forest management, the forest policy of Tanzania aims at achieving a triple-objective: improved forest governance/local democracy, improved local livelihoods, and improved forest conditions (URT, 1998).

Scholars have sought to problematize the technical framing of participatory forestry as representing a paradox. Participatory forestry reforms aimed at achieving popular participation are framed in terms that favour domination by professional foresters, undermining equity and efficiency in the process (Lund, 2015; Poteete & Ribot, 2011; Ribot et al., 2006). The framing of participatory forestry in scientific and bureaucratic terms amount to professionalization of the

scheme, which contradicts idioms of participation (Lund, 2015). The framing privileges scientific forestry knowledge and thus places professional (trained) foresters before villagers. In other words, the framing makes scientific knowledge and central authority as starting point of negotiations about forestry and forests on village land and not the other way round (Anstey, 2009). Local communities are thus left overly dependent on professional foresters for such activities as inventories, management and harvesting planning, and bureaucratic procedures associated with harvesting in VLFRs. Further, professionalization of participatory forestry enables elite capture. Through professionalization, "community management becomes committee management" (Zulu, 2008) in which few elites in the village actively participate and appropriate most of the benefits associated with forest management, for example training and project activities and allowances (Green & Lund, 2015; Lund & Saito-Jensen, 2013).

Further, professionalization means that CBFM comes with a high price tag. Village land use, management and harvesting planning are costly exercises. Scheba and Mustalahti (2015a) indicate that it took five years and approximately 150,000 Euros to complete the planning for 139,420 ha Angai forest in Liwale covering 13 villages. Overall, it took more than 20 years for Angai management committee to implement the first harvesting under CBFM arrangements. For most villages and under the existing situation in which it is difficult for villages to access credit, the cost of meeting the legal requirements is prohibitive and undermines participation. Due to high cost, PFM is almost exclusively implemented where external financial support is available (URT, 2015). Some foresters, and in particular forestry academics, have sought to brush aside the critique that professionalization makes CBFM unaffordable for local communities arguing that scientific requirements shall preside over cost concerns. They further argue that it is wrong to expect that CBFM would be cheap for it seeks to introduce forest management where none existed (Participant observation #138).

Technical and financial constraints produce non-implementation. PFM practitioners agree that management plans for VLFRs are weakly implemented (Participant observation #90).[3] Management plans are often prepared to meet legal requirements before being left to gather dust.[4] In Nepal and Mexico, research shows that in the management of forest, communities draw on sources of knowledge other than technical forest management plans (Mathews, 2011; Rutt et al., 2015). Further, cases of foresters taking shortcuts in the preparation of forest management plans for VLFRs are not uncommon. Mathews (2011) and Rutt et al. (2015) made similar observations in Mexico and Nepal respectively. The terms of reference for an assignment to improve the quality of forest management plans in Tanzania reads "the quality of most Forest Management Plans

(FMPs) is not adequate for operative planning and is directly related to the capacity of the facilitating personnel and/or budgets in use" (Indufor, 2014).[5] This means that even if these plans are implemented as scripted, they are not sufficiently scientific and therefore ineffectual.

Despite the technical, financial, and practical difficulties of implementing CBFM couched in scientific forestry principles, professional foresters keep on emphasizing the technical approaches to participatory forestry. By doing so, they are effectively continuing the colonial project of managing mangroves and miombo woodlands professionally, a project started by German's colonial foresters in 1890s (Sunseri, 2009). Yufanyi Movuh (2012, p. 70) argues that the framing of participatory forestry in techno-scientific terms reiterates the colonial policy of excluding local communities, failing as a result to "correct their previous exclusion by the colonial policy in the management of their forest resources". Forestry as a colonial project sought to emphasize the superiority of European cultures and was thus based on racial stereotypes in which Africans were represented as unable to calculate and therefore unfit to preside over the management of woodlands (Sullivan, 2017; Yufanyi Movuh, 2012). Racial stereotypes endure today, not only in forestry but also in wildlife management (Garland, 2006). Despite being racially charged, scholars have observed that (and through my own experience) "the perceived necessity of expertise is not questioned by village residents, only the exclusive and anti- democratic consequences of the way it comes to be reproduced" (Green & Lund, 2015, p. 27). Some foresters have tried to use the fact that local communities do not question the necessity of expertise as a justification for detailed technical management and harvesting plans (Interview #88).

This thesis was motivated by all these concerns about the technical framing of participatory forest management, especially community-based forest management (CBFM). Specifically, the thesis is motivated by observations that not only professional foresters, even local communities appear not to question the necessity of scientific forestry employed to govern them and to legitimate measures against their use of forests. The ambition is to draw attention to the subjectivities created through education and institutional socialization to seek explanation beyond the intentionality of professional foresters. The idea is not to ignore foresters' self-seeking behaviors but to shed light on how political economy and the oppression that accompanies it may be naturalized by ways of thinking that have their roots in a time that we today recognize as racialized and exploitative (colonialism) but which are ironically still seen by many as a civilizing mission.

1.2 Research Problem

The literature surveyed above indicates that the framing of community-based forest management in techno-scientific terms inhibits its implementation and disfavours the participation of villagers in forest management that the policy intends to achieve. The question is why and how the technical framing came into being and endures? The present problem is the one of explaining the persistence and primacy of the scientific framing of forestry practices. While the framing may appear natural to most professional foresters, scholars (anthropologists, political ecologists, critical geographers) have sought to problematize it in which state authority is assumed to be based on official knowledge (Mathews, 2004; Mathews, 2005). Technical framing of CBFM is seen as an attempt at state formation in which state-like local institutions are created and local actions on forests are systematized according to the taste of the state (Agrawal, 2001).[6]

As hinted in the previous section, scholars have discussed how the framing of CBFM in techno-scientific terms may entrench political economies that allow state officials to access benefits associated with forest exploitation and management. Studies conducted at the local levels have found that actual practices rarely follow the technical management plans, prompting suggestions that these plans serve purposes other than forest management (Green & Lund, 2015; Lund, 2015; Nightingale, 2005; Ribot, 2004, 2009; Ribot et al., 2006; Scheba & Mustalahti, 2015b; Vandergeest & Peluso, 2006a, 2006b). These studies, implicitly or explicitly, explain the technical framing of CBFM in terms of preferred end values i.e. the known valuable ends (power, incomes, improved forest condition) influence forestry practices.

A smaller body of literature use Bourdieu thoughts to explain forestry practices in terms of acquired dispositions and taken for granted assumptions that make foresters more likely to produce certain practices (Garland, 2006; Ojha, 2006, 2008; Ojha, Cameron, & Kumar, 2009; also see Zink, 2013). These studies also put power over forests and forestry as being at stake in the professionalization of CBFM. But the difference is power struggles are thought to take subtle and soft forms imperceptible to both the professional foresters and villagers. The struggle involves influencing practices through shaping the thinking and the worldviews of actors. Rather than being influenced by valuable ends, practices of foresters are thought of as being a product of culture (Swidler, 1986). This way, the contradictions, harmful, and unjust outcomes of the technical framing of CBFM are misrecognized because the framing is compatible to foresters' logics of appropriateness (also see Fleischman, 2014).

The thesis is inspired by Ojha (2008) and Lave (2012b) to search for a cultural explanation of

forestry practices (Swidler, 1986). It specifically seeks to use Bourdieu conception of practice (Bourdieu, 1972, 1990) to contribute to the existing literature by examining the extent to which practices in Tanzania's forest management field are a product of acquired dispositions and taken for granted assumptions as they are a product of other things. This approach is preferred as it preserves foresters' moral sense i.e. professional foresters do not simply venture out to produce practices that are harmful to the forests and rural livelihoods. The approach expands the scope of analysis to include biases acquired through forestry training and naturalized through interactions amongst foresters with shared dispositions.

1.3 Research Questions

The thesis is thus addressing the following question: How are ideas about and authority of scientific/professional forestry reproduced in Tanzania's forest management field? Specifically, the thesis seeks to answer the following questions:

(a) Does forestry education in Tanzania produce and reproduce scientific forestry dispositions (habitus)?
(b) What role do forestry academics play in reproducing the authority of scientific forestry?
(c) What are the assumptions underlying management practices in forestry?

Following Bourdieu (1975) and Lave (2012b), forestry education is examined for how it creates subjectivities i.e. processes through which foresters become scientific forestry subjects – disciplined by its principles and identify with its discourses and practices (Nightingale & Ojha, 2013). That is the effect of disposing students of forestry towards technical approaches. Forestry academics enjoy the highest scientific authority in the forest management field. They serve as scientists and experts (Stehr & Grundmann, 2011). The aim here is to examine their activities (research and consulting) for the strategies/censorship applied (consciously or unconsciously) to keep the authority of scientific forestry (Bourdieu, 1975). In this case, practices are conceptualized as a product of, among other things, internalized dispositions and taken for granted assumptions that makes foresters produce practices even when these practices are constrained by practical realities (Bourdieu, 1972; Ojha, 2008).

To raise these questions is not to reject science and scientific knowledge as some of my interlocutors have countered. Quite the opposite. Scientific forestry has been proven successful in the management of exotic fast-growing species. These questions are expected to make scientists conscious of the taken for granted assumptions and the ways in which the scientific knowledge they produce may engender oppression in unexpected and unacknowledged ways. One can only

hope that the ultimate effect is the rethinking of the assumptions and production of scientific knowledge that is socially just and predicated on local context. These questions seek to remind forestry scientists and those they engage with that most of the activities they consider obvious are political investments that serve to reproduce existing power relations in the forest management field.

1.4 Justification for the Study

This study has the potential to deliver many of the benefits of social sciences to conservation as detailed in Bennett et al. (2017). Examining and specifying the subtle/symbolic workings of power in Tanzania's forestry can deliver diagnostic, disruptive, and reflexive values. It can help with diagnosing the causes of contradictions and failures of such grand schemes as CBFM designed to manage forests on village lands. The study can also help in disrupting repressive design of forestry practices beyond "merely replacing one modality of domination with another" by specifically "addressing and undoing mechanisms that enable continuation of arbitrary workings of power" (Emirbayer & Johnson, 2008:32). Here, arbitrary workings of power refer to producing repressive practices unreflexively i.e. below the level of consciousness.

Through shedding light on unseen limitations and partiality of knowledge, the study can contribute to rethinking of the underlying assumptions of scientific forestry model in view of practical realities, including the taken for granted emphasis on technical approaches to forestry, and the careful scrutiny of alternatives. In fact, this study can inspire rethinking of forestry curricula and pedagogy in order to ensure that imposition of dispositions is not oppressive, providing forestry graduates with schemas (cognitive capacities) to evaluate problems in forest management in multiple ways. That is forestry graduates who leave no assumption unchallenged. By calling for a rethinking of the scientific forestry and in particular its deployment in CBFM, this study can contribute to the creation of socially just forestry, which is crucial especially because people across Tanzania depend on the woodlands as a source of livelihoods and energy (Abdallah & Monela, 2007). And as Hansen and Lund (2017) argue, forest management approaches that are calibrated to local contexts are likely to make foresters more relevant to people and forests.

This study also contributes to the literature on state making and state power by including forestry education in the analysis of practices in the forest management field. It is generally accepted that state power is based on state knowledge and the ability of the state to represent its knowledge as official knowledge (Mathews, 2011; Scott, 1998). Yet, as for the case of Mexico, what is considered official knowledge in Tanzania's forestry sector is fragile (Mathews, 2011), and

depends on the dispositions imposed on and acquired by state officials in their professional training. Thus, to understand practices in the forest management field, one has to analyse the processes of inculcating professional dispositions on foresters. Thoughts, ideas and biases that state forestry officials come to embody and accept as official knowledge reflect the history of individual foresters including the professional training he/she received. Forestry education must thus be considered as part of the state project to consciously or unconsciously define and redefine official forestry knowledge. Bourdieu et al. (1994, p. 1) summarize it nicely by arguing that "one of the major powers of the state is to produce and impose (especially through school system) categories of thought that we spontaneously apply to all things of the social world, including the state itself". With this understanding and following (Lave, 2012b), this study treats the production, circulation, and application of scientific forestry knowledge as intertwined.

1.5 Thesis Structure

Following this introductory chapter, the thesis proceeds as follows. Chapter 2 presents theoretical framework applied in this study in which core concepts underlying Pierre Bourdieu specification of scientific field and practices are discussed. Chapter 3 outlines methods and methodological issues relevant to this study. Chapter 4 sets the scene for the analysis that follows by providing historical and scientific contexts. Among other things, the chapter defines scientific forestry and its limitations relevant to this study. Chapter 5 presents findings from the analysis of the forestry education in Tanzania. Chapter 6 discusses the role of forestry academics in producing and reproducing scientific forestry dispositions. Chapter 7 presents findings from the analysis of practices of foresters in the forest management field. Chapter 8 summarizes the main findings, states the conclusions, and discusses the implications. Also, it offers some recommendations.

Chapter 2: Theoretical Framework

As stated in Chapter 1, this thesis assumes that professional foresters do not venture out to deliberately harm forests and rural livelihoods. Rent-seeking or not, professional foresters are seen to cling to the scientific forestry principles. Further, irrespective of whether the goal is to increase participation or some other interests, they consistently and persistently emphasize on technical approaches to forestry even when it is virtually impossible to do so in practice. When it seems virtually impossible to implement the model due to meagre funding, foresters still maintain that funding should be made available to implement the ideal forestry. When the complexity of natural forests e.g. miombo woodlands confounds the ideals of scientific forestry, foresters blame insufficient funding to carry out detailed inventory and/or poor implementation of plans. They rarely question the necessity and relevance of the scientific forestry model in the management of miombo woodlands. Further, villagers do not appear to question the merit and necessity of scientific approaches used to conduct their interactions with forests, much as they may speak out against the consequences of such approaches. This presents us with a puzzle: both foresters and villagers appear to misrecognize acts of domination/oppression predicated on the scientific forestry knowledge.

Deciphering this situation requires a theoretical framework able to explain actions in terms beyond the intentionality of actors. Pierre Bourdieu conceptualization of practice comes in handy. Section 2.1 presents Bourdieu framing of practice and domination. As we will see, dispositions and presuppositions spawning practices require educative action capable of creating them. Thus, section 2.2 presents Bourdieu's specification of scientific field. Further, section 2.3 presents a theoretical framework for analysing forestry education, specifically pedagogy of oppression and epistemic violence.

2.1Theory of Practice

Figure *1* shows the relationship in core concepts underlying Bourdieu's dispositional theory of practice – field, practice, habitus, doxa, and symbolic violence. For Bourdieu, the unit of analysis is a *field* and his main concern is the production and reproduction of class relations and thus *practices* of achieving power, and domination. He conceptualizes field as "a bounded, structured social arena that provides a particular set of opportunities and constraints" (Lave, 2012b, p. 10). Examples of social fields are academic, artistic, political, pugilistic, and scientific.

As it can be seen in the diagram, the key feature of social fields is that they are distinct from each other. Each social field specifies its *objective structure/position*. For example: professorship is an objective structure in a scientific/academic field, principal forest officer is an objective structure in a forest management/governance field. Participants in a social field utilizes their *subjective structure* to produce practices geared towards occupying objective positions the field provides. The subjective structure is "the *habitus* that agents within the field acquire through participation in it and the dispositions they bring to it" (Lave, 2012b, p. 11, emphasis added). It follows that a social field is a combative place and what is at stake is dominant positions within the field. A field is thus inherently political in which participants (tacitly) agree on and take what counts as legit practices for granted (*doxa*). As we will see, as a shared disposition and presupposition amongst members to a field, habitus and doxa are what defines the field.

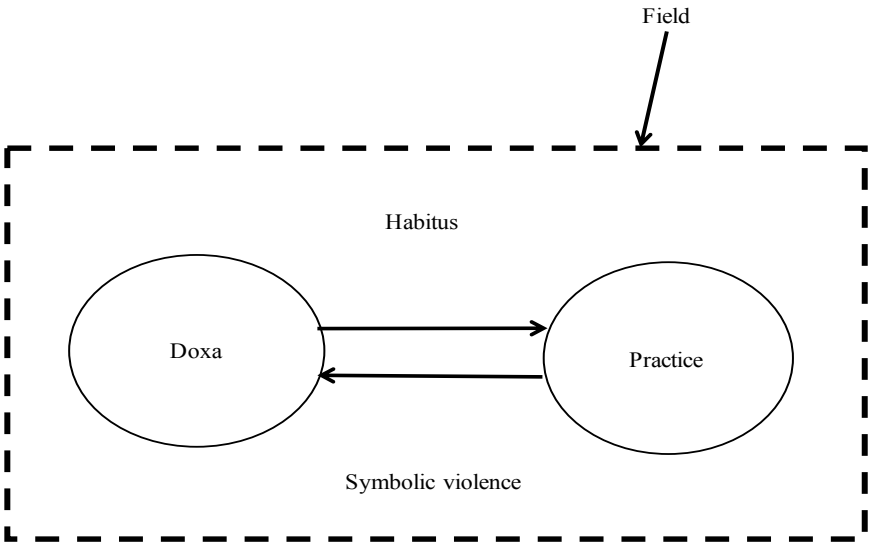

Figure 1: Conceptual Framework

Perhaps one of the best ways to access Pierre Bourdieu concepts and thoughts (especially for non-sociologist) is through the writings of his student, sociologist Loïc Wacquant. Wacquant (2004) succinctly introduces Bourdieu core concept of habitus and practice. It is probably the way Bourdieu conceptualizes practice that sets him apart from the rational theoretic conception of actions but without ruling out the strategic calculations of agents. For Bourdieu, practice is

> "the product of a dialectical relationship between a situation and a habitus, understood as a system of durable and transposable dispositions which, integrating all past experiences, functions at every moment as a *matrix of perceptions, appreciations, and actions*, and make it possible to accomplish infinitely differentiated tasks, thanks to the analogical transfer of

> schemata acquired in prior practice (cited in Bourdieu, 1972, p. 261; cited in Wacquant, 2004, p. 316, emphasis in original).

Using the concept of habitus, Bourdieu seeks to overcome the structure - agency duality by showing that practice is neither a product of structural dictates (e.g. legislations) nor a product of intentional pursuit of goals (e.g. money or professorship). Rather, transposable dispositions make it more likely for members of a social field to produce certain problematization and certain actions come to be seen as legitimate in the pursuit of professorship, for example. It is tempting to think that because habitus is durable and makes certain practices more likely, it thus lacks creativity, and change from within the field is impossible. This is partly true in the sense that the most senior members of the field with years of experience are less open to radical ideas threatening to disrupt the social order. It is also partly untrue because habitus is creative but predictable. Wacquant (2014, p. 121) writes "habitus of great innovators in arts, music, science, or politics is precisely the precipitate of their mastery of the gamut of strategic possibilities in their field, and the principle of their capacity to actualize options pregnant in it". The habitus of great foresters may dictate that a hammer (used to legalize timber or otherwise) is indispensable. But how to use the hammer in different situations to actualize domination depends on foresters' creativity. Seasoned foresters have more mastery of the possibilities available in the forest management field for creatively deploying the hammer in pursuit of some ends.

As a set of dispositions (schemes, mental structures), habitus operate beneath the level of consciousness. A professional forester does not ask him/herself at every instance whether inventory-based management plan is necessary or not. A goalie in a soccer game does not debate at every instance whether to stop the ball from going into his or her own team's goal or to go on offensive and attack the opposing team goal – he just knows that as a goalie, his position in a team is to protect his team's goal and that he has learned to produce certain practices. Maasai women do not debate every morning whether to take cattle out for grazing cattle or to go and fetch water and prepare a meal for the family. Each of these actors have occupied certain positions in their social fields and have naturalized what they are expected of them in relation to others in the field. If a forester produces practices that are incompatible with the dominant view in the forest management field, he/she risks be seen as an outcast by other foresters and that might cost him/her opportunities to scale up the ladder to the dominant positions in the field. He might as well be expelled from the field. In this way, seemingly legal and legitimate practices can be oppressive and violent without the knowledge of actors producing them. Domination thus takes the form of symbolic violence.

Members to a field sharing dispositions (habitus) develop set of assumptions that they take for granted in producing practices. Bourdieu refers to these assumptions as doxa. Doxa is an aggregate of presuppositions, undiscussed, undisputed, unthought, self-evident in a field (Bourdieu, 1972, 1975; Bourdieu & Eagleton, 1992). Ojha (2008) provides a good example. When we walk on a sidewalk familiar to us, our practice of walking is based on the taken for granted assumption that the surface is firm to avoid sinking, no capricious elevation, and that we are not going to step on a landmine. In many African cultures, members do not ask themselves whether to give something to the person they respect with the left or right hand – we take it for granted that the right hand must be used, even when one is left-handed. All these things are 'unthought' when we enact a practice of walking and giving. But our walking habitus shape our pace, how we respect other pedestrians, and the time spent greeting relatives, friends, and acquaintances we encounter along the way.

Bourdieu argues "by using doxa we accept many things without knowing them" (Bourdieu & Eagleton, 1992, p. 114). Doxa emphasizes naturalization of ideas, rendering certain assumptions into the category of the unquestioned. Doxa is what makes a forester insist on marking logs with a special hammer without even knowing whether such a practice serve the forests and rural livelihoods well. Foresters do not discuss whether marking logs is necessary or not – for them, it goes without saying that it is necessary to mark logs. Doxa is what make villagers not question the necessity of technical and procedural approaches and scientific claims used to dominate them. Environmentalism is pervasive in Tanzania's villages. Brockington (2006) offers instrumental analysis of the phenomenon, obscuring the possibility that villagers are truly concerned by environmental change (declining and unpredictable rainfall) and that they take technical explanation that "trees cause rain by dragging in clouds" for granted. This does not mean that villagers accept everything but rather doxa makes them "assent to much more than we believe and much more than they know" (Bourdieu & Eagleton, 1992, p. 114).

In Masculine Domination, Bourdieu develops the concept of symbolic violence in his efforts to understand gender relations, in particular men's domination of women. He was motivated by what he calls "paradoxical character of doxa" (Bourdieu, 2001, p. 2) i.e. "the symbolic order of the world broadly respected, even by those who are most disadvantaged by it" (Hull, 2002, p. 351). Bourdieu (2001, p. 2) defines symbolic violence as "*a gentle violence, imperceptible and invisible even to its victims, exerted for the most part through the purely symbolic channels of communication and cognition (more precisely, misrecognition), recognition, or even feeling*" (emphasis added). Unlike physical violence, symbolic violence (or "soft violence") subsists on the misrecognition of power relations in a social field. It is a product of conditioning of structures

of cognition, thoughts, and perceptions (i.e. habitus) in such a way that the dominant and dominated come to see the social order as natural i.e. misrecognize the domination, privileges, and injustices. The dominant and the dominated are not necessarily aware that their thoughts and perceptions naturalize and perpetuate domination and injustices. The concept of symbolic violence invites us to consider a more mundane form of violence that is arguably more damaging and easier to perpetuate than corporeal/physical/direct abuses.

The notion of symbolic violence allows for the possibility that when professional forester emphasize on technical approaches to CBFM, they do so not because they intend to wreck violence against villagers. They do so because scientific forestry is conventionally, and symbolises, an appropriate way of managing forests. Symbolic violence also means that villagers are unlikely to question the primacy of scientific claims. They themselves have come to accept that scientific approaches are superior and 'natural' methods for managing forests.

Following Ojha (2006); (Ojha, 2008), this thesis is interested in explaining practices in terms of habitus (dispositions), doxa (presuppositions) and symbolic violence. The thesis does not seek to rule out the possibility of foresters' strategic calculations aiming at ends. Rather, it seeks draw attention to habitus and doxic thinking as they normalize and naturalize oppression, which Bourdieu declares as a "formidable mechanism" of domination (Bourdieu & Eagleton, 1992, p. 114). In the context of Nepal, Ojha (2006); (Ojha, 2008) shows that techno-bureaucratic habitus – dispositions towards scientific forestry and technical doxa, or taken for granted assumptions that technical practices lead to better forest management - are closing the space for deliberation. Further, he shows that civil society habitus – communities' thinking that they are not part of the government and fatalistic doxa – the taken for granted assumption that the government is powerful and always on the know side. This thesis extends Ojha (2006) in an attempt to demonstrate that similar mechanisms are at play in Tanzania's forest management field by focusing mainly on the practices of professional foresters.

Talking of scientific forestry habitus and technical doxa is to refer to professional foresters' culture.[7] As Ann Swidler (1986) aptly observes, the *cultural explanation* of foresters' practices understands culture as a 'tool kit' or repertoire or resources (materials from which individuals and groups construct strategies of action) that foresters use to construct strategies of action (strategy as in 'general way of organizing action'). The tool kit is comprised of symbols, rituals, beliefs, rituals, and worldviews that govern practices. The foresters' tool kit for constructing strategies of action is comprised of scientific forestry principles and bureaucratic ideals it nurtures. The cultural explanation is in contrast to the view that actions/practices are influenced by 'interests' or 'ends'

(power or money). It is worth quoting Ann Swidler (1986, p. 277) at length:

> "If culture influences action through end values, people in changing circumstances should hold on to their preferred ends while altering their strategies for attaining them. But if *culture provides the tools with which persons construct lines of action, then styles or strategies of action will be more persistent than the ends people seek to attain*. Indeed, people will come to value ends for which their cultural equipment is well suited" (emphasis mine).

In Tanzania's forest management field, we observe the persistence of actions couched in scientific forestry principles. As Ann Swidler (1986, p. 277) observes, culture thus comes in handy to "explain continuities in action in the face of structural changes" and "why different groups behave differently in the same structural situation".

2.2 Scientific field as a social field

Bourdieu presents the framework for analysing the political economy of production of scientific knowledge in the *Specificity of Scientific Field and the Social Conditions of the Progress of Reason* (Bourdieu, 1975). He sets out by specifying that "the "pure" universe of even the "purest" science is a social field like any other, with its distribution of power and its monopolies, its struggles and strategies, interests and profits, but it is a field in which all these *invariants* take on specific forms" (Bourdieu, 1975, p. 19 , emphasis in original). Like other social fields, production of scientific knowledge is characterized by power struggles and scientific authority is at stake in a scientific field. He defines scientific authority as "*technical capacity and social power, or, to put in another way, the monopoly of scientific competence, in the sense of a particular agent's socially recognized capacity to speak and act legitimately (i.e., in authorized and authoritative way) in scientific matters* (Bourdieu, 1975, p. 19, emphasis added)". Scientists in a scientific field devise strategy (consciously or unconsciously) to ensure that they occupy a dominant position in a field. And by *socially recognized*, Bourdieu is referring to a scientist being recognized by his peers (competitors) in a field as authority.

In a given scientific field, scientific capital (scientific authority) is unequally distributed. Those occupying dominant positions (senior scientists) possess more scientific capital and thus appropriate more profits than new comers. For this reason, competition for scientific authority is often imperfect and it is often impossible to achieve a monopoly of a specific scientific capital (Bourdieu, 1975). Those in the dominant positions often seek to reproduce the scientific capital they possess and therefore they chose *conservation strategies* – strategies "seeking to perpetuate the established scientific order to which their interests are linked" (p. 29). Those new to the field may opt to pursue either *conservation* or *subversion strategies*. For new comers, conservation strategy i.e. choosing to learn from predecessors and do things as they do is a safe bet as it guarantees career development and profits in the same legitimation terms as those of predecessors.

Those in dominant positions are likely to endorse a new comer if he/she doesn't rebel against their established and "proven" ways of doing things.

Subversion strategy is risky and costly because it puts one at loggerhead with the established order unless whoever is pursuing the strategy achieves "a complete redefinition of the principles of legitimating domination" (p. 30). A starting faculty who chooses to redefine and topple the existing legitimate science in a particular field e.g. a way of doing forestry is running the risk of failing to develop his career in that field and being expelled based on the rules specific to that scientific field. According to Bourdieu, this is what makes heretical science a rarity and enables "reproduction of producers (or reproducers) and consumers of [scientific] good" (p.30).

In Bourdieu framing of scientific field, strategies to achieve more scientific authority involves such mundane activities as choice of research topic, deciding on the research questions and methods, application for research funding, and choice of place of publication. A scientist may choose to argue that there is no politics in these otherwise purely scientific activities but Bourdieu (1975, p. 21) argues that "this becomes apparent when one observes what happens if the scientist discovers that someone else has just published a conclusion which he was about to reach as a result of his own research". A well-established scientific field tend to crystallize research questions to those scientists in the field think they can answer without bringing the field into a disarray. Scientists in this field "tend to occlude the fact that it only solve the problems it can raise and only raises the problems it can solve" (Bourdieu, 1975, p. 31).

This thesis seeks to examine whether the way research topics (and by extension consultancies) are framed reduces the possibility of research critical to dominant views in Tanzania's forest management field to emerge. Further, the thesis is interested in diversity of ideas, especially epistemological disagreement. In other words, of interest here is the censorship applied - the questions not asked or rather not allowed to be asked. The first level of censorship is imposed when the dominant rejects ideas that threaten the established scientific order. Professors are less likely to accept arguments that threaten the basis of their professorships and thus produce practices to suppress, consciously or unconsciously, other forms of knowledge.

Bourdieu (1975) points to a more radical form of censorship. The basis of science is the "collective belief in its bases", which is taken for granted (doxa) by participants in a scientific field (Bourdieu, 1975, p. 34). In this case, scientific knowledge reflects consensus amongst scientists in the scientific field about the basis of what counts as scientific. In their scientific operations, scientists in a scientific field presuppose a set of assumptions (beliefs). These presuppositions (doxa) tacitly predispose scientists in a scientific field to accept only certain things as scientific. In other words,

the presuppositions defining the field form the basis for resolving scientific disagreements amongst members to the field. In this case, a scientific disagreement does not mean a disagreement on the rules for settling the disagreements – the rules are agreed already and form the doxa constituting the field. When scientists in a field disagree on the rules for settling scientific disagreements, then the field is in crisis.

A scientific field and order exist because there is the "consensus on the objects of dissensus" i.e. the agreement on the framework for determining what is right and wrong (Bourdieu 1975:34). And the "common interests underlying conflicts of interests" – the common interests being the shared presuppositions (shared epistemic commitments) and these are never discussed (taken for granted) (Bourdieu 1975:34). To belong to a scientific forestry field, one must commit to its sacred rites. In some fields, e.g. economics and even forestry, statistics is seen as the golden standard of evidence for example. Presence or absence of contrasting ideas in the forestry scientific field is thus a key indicator of how forestry academics contribute to the perpetuation of the existing power relations in forest management field.

To examine forestry academics consultancy activities, I complement Bourdieu's framework with Stehr and Grundmann (2011) conception of experts. Scientific knowledge, by definition, is not necessarily intended to lead to actions. Stehr and Grundmann (2011) define experts as those who produce expert knowledge geared towards enabling particular actions to be taken. Experts are not producers of scientific knowledge but rather mediators sitting in between scientists and non-scientists seeking expert advice to legitimate their decisions. Because of the existence of plethora of scientific knowledge, non-scientists users of the knowledge looking to take actions need assurances – hence the growing demand for experts. Non-scientists users engage experts to break it down for them, target it, and offer advises leading to actions. Expert knowledge thus presupposes that there is urgency to take actions. Experts "create certainty in decision making" (Stehr & Grundmann, 2011, p. 43) where none exist or decision makers feel they need it. Through their expert advices, experts legitimate political decisions. As a decision maker, being able to say that a particular decision was based on expert opinion from a well-known expert is an act of legitimation and assurance.

In this framing, forestry academics serve as double agents: they are both scientists and experts. They produce scientific knowledge while at the same time they advise government foresters on the forest management actions to take. This coincides with Lave (2012b) insight that production, circulation, and application of knowledge are inseparable and affected by the same political economic forces. Forestry academics as scientists produce scientific knowledge with the awareness of how forestry academics as experts will circulate and influence its application. In

addition, forestry academics are appointed to occupy various senior positions in the forestry bureaucracy, including director of forest service and medium-term full-time consultants. This further makes the conventional separation of production, circulation, and application impossible for forestry academics in the forestry bureaucracy are likely to increase the demand for scientific knowledge produced by forestry academics. This thesis reviews forestry academics' consulting work for how it contributes to the reproduction of scientific forest management field.

2.3 Criticisms of Bourdieu's concepts of Habitus and Field: Continuity and Change

Sociologists have long debated Bourdieu's concept of habitus (see special section in Body and Society, 2014: 20(2)) and the debate revolves around determinism and freedom (agency). In particular, Bourdieu's framing appears to suggest that practices only spring out of habitus, positioning him in one end of the agency – structure continuum that he sought to overcome. Further, the framing appears to suggest that change from within the field is impossible because the social field reproduces itself. That habitus is a "black box" that routinizes practices (Wacquant, 2013) and that "habitus do not revise themselves and cannot be regarded as a source of creativity" (Crossley, 2014, p. 108). Sewell (1992) argues that Bourdieu 1977 retains the "agent-proof quality" when he writes "As an acquired system of generative schemes objectively adjusted to the particular conditions in which it is constituted, the habitus engenders *all the thoughts, all the perceptions, and all the actions consistent with those conditions and no others*" (Italics mine).

If your perception and dispositions toward the world are governed by social structures which are internalized over time, why and how can we even talk about agency? Further, if all participants to a social field do is to acquire and internalize the existing dispositions and proceed to reproduce, consciously or unconsciously, the existing social structures, it follows that the possibilities of structural change are erased. But there are plenty of situations where thoughts, perceptions, and actions are inconsistent with the reproduction of existing social order. Sewell (1992) argues that Bourdieu himself recognizes that "acquired and internalized schemas can creatively be applied across a wide range of circumstances (transposability of habitus) but he hasn't drawn the correct conclusions from his insights". Bourdieu (1990) argue that habitus govern practices not through 'mechanical determinism' but by setting 'constraints and limits' within which a creative actor acts freely. Bourdieu's conception of habitus as "infinite capacity to generate products within limits" resonates with Swidler's conception of culture as a toolkit used by actors to create strategies of action. Inasmuch as an actor is creative, she operates within the limits of dispositions and cultural toolkit she has access to. Just as your income limits the

combination of goods and services you can afford (budget constraints), habitus (cultural constraints) limits – not determine – the combination of practices one can produce in a social field.

It follows that a well-established social field endures because it is not easy to change the habitus. While habitus permit creative response to new situations, this process is usually slow and not revolutionary (Swartz, 2002). Habitus tend to perpetuate the established social order in fields where "the constraints and the opportunities are similar to those present during the formative period of the habitus" (Swartz, 2002, p. 66). The established field resonates with Swidler (1986) notion of settled culture/lives with its short-term effects of refining and reinforcing habits and long-term effects of creating continuities.

Much as habitus is powerful in producing continuities, it can also produce change when "dispositions of habitus do not fit well with the constraints and opportunities of the fields (situations)" (Swartz, 2002, p. 66; also see Ojha, 2006 & Wacquant, 2013). In a situation of migration, for example, habitus can be completely overwhelmed and eroded (Wacquant, 2004). If a critical mass of foresters sharing dispositions different to those currently dominating Tanzania's forest management field enter the field, structural change is a likely outcome. Again, this resonates with Swidler (1986) notion of unsettled culture with its short-term effect of teaching new modes of action and long-term effects of creating new strategies of action.

It is probably important to stress here that Bourdieu does not reject the idea that agents act strategically aiming at particular ends. In the Logic of Practice, Bourdieu (1990, p. 53) writes "it is, of course, never ruled out that the responses of the *habitus* may be accompanied by a strategic calculation tending to perform in a conscious mode of operation that the habitus perform quite differently, namely an estimation of chances presupposing transformation of the past effect into an expected objective". A forester may be consciously aiming at controlling the timber in VLFRs for his or institutional benefits (anticipated profits). This forester can choose from a wide range of technical and non-technical strategies to achieve his goal. What inclines or limits him to pick technical strategies is scientific forestry habitus. Agents draw on the habitus to respond to stimuli. Bourdieu argues that even when agents produce responses consciously aiming at ends, "these responses are first defined, without any calculation, in relation to objective potentialities" (Bourdieu, 1990, p. 53). A forester is firstly predisposed to think, feel, and act like a forester before he can respond to different situations as a forester.

Bourdieu is emphasizing that scientific field as a social field is autonomous and scientific authority is determined in relation to other scientists in the same field. It is this emphasis on

autonomy of the field that Lave (2012b) disputes and modifies for Bourdieu to serve as a link between political economic analysis of the production, circulation, and application of scientific knowledge. Lave (2012a, p. 379) writes "in contrast to this contained vision, a major part of what is at stake is the question of which outside fields should serve as the pole stars orienting the field's axis". In this view, a scientific field concerned with only production of basic science would probably be autonomous in the sense of Bourdieu conception. Perhaps, only the competitors in the scientific field are likely to pay attention to the basic science. But a scientific field concerned with production of applied science is likely to be influenced by and wield authority beyond that involved in the production and circulation of scientific knowledge. Conceptualizing a scientific field as porous exposes the struggles for authority in it to the same political-economic forces shaping the circulation and application of knowledge. Forestry scientific field in Tanzania is dominated by forestry academics mainly based at Sokoine University of Agriculture (SUA). As we will see, the forestry scientific field is non-autonomous, influenced by forces from outside the core of the field.

2.4Pedagogy of oppression, Epistemic violence, Symbolic violence

As stated before, one of the strategies used to reproduce the established scientific order is cultivation of scientific habitus. Habitus is this sense means "systems of generative schemes of perception, appreciation and action, produced by a specific form of *educative action*, which make possible the choice of objects, the solution of problems, and the evaluation of solutions" (Bourdieu 1975, 30, emphasis added). Bourdieu and Passeron (1990, p. 5) "*all **pedagogic action** (PA) is, objectively, symbolic violence insofar as it is the imposition of a cultural arbitrary by an arbitrary power"* (emphasis in original). By *educative action* and *pedagogic action*, Bourdieu is not only referring to official education with written curriculum, teaching methods, and learning outcomes (institutionalized education). He is actually referring broadly to any system that is educative in function and capable of instilling habitus including diffuse education (from educated members of the society to non-educated), and family education – passing down hunting techniques in hunter-gatherer cultures. For this reason, it becomes important to analyse forestry education contents and pedagogy in Tanzania for the role it plays in keeping the established scientific order undented. In addition to Bourdieu, I also draw on Freire (2000) *Pedagogy of the Oppressed* for this task in which forestry education is not considered neutral and value free as people engaged in providing it might wish to think.

For Bourdieu and Passeron (1990), education (pedagogic action) is necessarily a way of legitimizing domination "in so far as it is the imposition of cultural arbitrary by arbitrary power". It is symbolic violence in so far as it involves mental conditioning produces and reproduces the

cognition and recognition of power relations. Pedagogic action is symbolic violence when it is designed to inculcate the knowledge of the dominant in such ways that make recipient of pedagogic action to recognize (and thus misrecognize) oppressive practices as legitimate. It is also symbolic violence when it is designed to inculcate the dominated knowledge and views in such a way that the dominated come to see their own domination as legitimate. Further, pedagogic action is symbolic violence even when it is emancipatory i.e. when it is designed to radically change the power relations and redress inequality. In other words, education can be designed to function as an instrument of conformity (permanence) or as a practice of freedom (change) (Freire, 2000). The question then becomes, what exactly is forestry education in Tanzania designed to do: permanence – preserve the existing scientific order or change – continuous reflection and questioning of the dominant view in the social field?

For Bourdieu, school pedagogic action is often designed to consciously or unconsciously perpetuate domination i.e. it seeks to naturalize the values and knowledge of the dominant. It is an instrument designed to achieve recognition by the dominated of the legitimacy of domination. For the current case, the forestry pedagogic action is decided by the forestry academics and professional foresters (the dominant) with little or no inputs from the local communities (the dominated). It thus makes it a probable candidate for the pedagogy of the oppressed in the sense that forestry students are made to accept their own (and their communities) domination and are recruited by the state to extend the domination. Because school pedagogic action is accepted even by those who never attended school as a powerful and dominant force, local communities come to "know without knowing" that externally sponsored knowledge is superior to their own (see the world in their oppressor's terms).

Freire (2000) considers as oppressive (overwhelming control of thinking and action) what he calls 'banking' concept of education – 'education as act of depositing' in which the teachers are the 'depositors' and students are the 'depositories'. The one in which "the scope of action allowed to the students extends only as far as receiving, filing and storing deposits" (Freire, 2000, p. 72). In the banking education system, "the teacher issue communiques (instead of communicating) and make deposits and students patiently receive, memorize and repeat" (Freire, 2000, p. 72). This is commonly known as rote learning in education literature. In rote learning, the objective of instruction is to promote retention and this associated with recognizing and recalling cognitive processes (Mayer, 2002). Students are tested for their ability to remember materials presented by the teacher. The test question might be "Mention three stages of plant succession?" In rote learning, learning is reduced to knowledge acquisition and the main problem is remembering the materials. While rote learning is part and parcel of learning, in and by itself, it is oppressive for it

does not emphasize problem posing and solving. A student subjected to rote learning is likely to acquire the views such as deforestation caused by villagers is a major problem. He is also likely to see that livelihood activities such as herding as destructive and outdated. Modernization and technical prescriptions are likely to appear natural and legit to this student.

One can argue that there is no other way of teaching the most technically demanding and highly specialized subjects e.g. engineering, neuroscience, and cardiology other than a knowledgeable teacher depositing on students in which the aim is conformity. This means that education in these subjects is necessarily oppressive because there is little room for error. While a cardiologist can question the established bypass surgery procedures, she has little room to try new techniques in the actual action of performing the surgery. The same argument can be said for forestry to justify the teaching of forestry for conformity as opposed to questioning. But in the case of forestry, the oppressive pedagogy is a matter of great concern because in countries like Tanzania, majority of people in rural areas with inadequate off-farm jobs depend on forests as a source of livelihoods. Scholars propose alternative pedagogies to those perpetuating domination. Thus, it is necessary for forestry education to aim for liberation, not conformity and oppression.

As Bourdieu and Passeron (1990), Freire (2000) thinks of pedagogy as a philosophy and not simply as a teaching method. To correct the oppressive banking system of education and thus make education liberating, Freire (2000) proposes a problem-posing pedagogy based on dialogue between the teacher and student. The proposed pedagogy of discovery seeks to place both teacher and students at par in which they both have something to contribute. It focuses on inquiry, not consumption. It focuses on sensitizing curiosity and critical reflection, not depositing and imparting knowledge. This way, education becomes instrument of liberation understood as “the action and reflection of men and women upon their world in order to transform it” (Freire, 2000, p. 79). Education is thus based on discussing and thinking about problems students can relate with and eager to develop new understanding of. It is not based on memorizing series of solutions generated in distant contexts. Science then ceases being a collection of facts that shall be memorized and applied unreflectively. Problem-posing pedagogy focuses on theorization as opposed to uncritical teaching and application of imported theories. This pedagogy is intended to help students develop the understanding that all existing knowledge, even the most obvious one and therefore taken for granted, is not beyond question.

Problem-posing pedagogy proposed by Freire (2000) points to meaningful learning as it is commonly understood in education literature. In meaningful learning, the objective of instruction is transfer – use the knowledge to solve problems, redefine problems and generate new concepts

i.e. discerning problems and generating solutions (Mayer, 2002). The emphasis is on understanding, analysis, and evaluation in which learning involves construction (as opposed to acquisition) of knowledge as students make sense of the materials. The emphasized cognitive processes include explaining, inferring, checking the internal consistency, and critiquing (Mayer, 2002). An assessment question in this case could be "if you are asked to propose a modification to the plant succession theory, what would it be and why?" In meaningful learning, students do not just acquire knowledge, they develop tools and frameworks for life time learning. Meaningful learning is thus liberating and non-conformist as it promotes understanding and questioning of the established knowledge. It also allows for multiple definition of problems and multiple solutions to problems.

Guided by these ideas, this thesis examines the curricula and pedagogy of forestry education for whether it is designed to produce oppressive or liberating habitus. The subjects included in the curriculum and syllabuses and those omitted can help in judging the underlying philosophy of the curricula, whether it is oppressive or liberating. Further, the teaching method is examined for whether it seeks to make students conform to the dominant views in forest management field or be reflective and critically scrutinize the dominant views for its formulation of problems and solutions it engenders. The chapter thus looks for evidences of rote or meaningful learning.

A disclaimer. This theoretical framework is cognizant of the fact that education theory is rich and not limited to Bourdieu and Freire framing. But because the interest here to document whether and how forestry education perpetuates or inhibit oppression, Bourdieu and Freire conception of education and pedagogy is sufficient for the task at hand. The decision to make this theoretical delimitation was reached to avoid reducing this thesis to education research only interested in the study of education theories and didactics. The thesis aim is different – to understand the contradictions, paradoxes, and incoherencies in forest management practices and how these are produced and perpetuated.

2.5Market – Driven Model for Higher Education

Market-based models are seen as modern and panacea to many of the problems. Most academics I spoke to about the restructuring of the university and the move towards commercializing and running the university as a business are certain that the market is going to solve most of woes facing the university today, the biggest one being underfunding. That it's a right move that the university is setting up a for-profit company especially considering the land size under its possession. They argue that SUA should be financially self-sufficient. The university should be able to enter into joint-ventures with private companies and set up shopping malls and hotels in

Morogoro. It should be able to set up a dairy that can cater for the entire country and beyond. And when it comes to the curriculum, the university should be able to design 'innovative' courses that will attract more fee-paying students. One would be hard pressed to find someone at the SUA campus who is against neo-liberalization of the higher education and education in general. Further, the inequality (injustice) it produces and its effect on the curriculum and pedagogy are rarely discussed.

My interlocutors accept neoliberalism uncritically, despite the existence of rich literature documenting its problems. By doing so, they condone the decline of public funding of higher education. Generally, this literature conceptualizes neoliberalism as a belief that competition is capable of delivering the greatest good to society, which leads to the privileging of market-based solutions to societal problems. The fact that it goes without saying to many people that market is the best problem solver led Rizvi and Lingard (2010) to conceptualize neoliberalism in terms of social imaginary understood as "a way of thinking shared in a society by ordinary people, the common understandings that make everyday practices possible, giving them sense and legitimacy" (page 34; also see Hursh, Henderson, & Greenwood, 2015). Understood this way, neoliberalism as a social imaginary resembles the Bourdieu's habitus concept (Rizvi & Lingard, 2010). Like habitus, a social imaginary is shared and internalized, shaping thinking and actions without people realizing. Neoliberalism as a social imaginary thus operate anonymously – without people being aware they are being guided by the ideology.

The impact of neoliberal thinking on education and production of environmental science in particular is well documented. Phillip Mirowski (2011) cited in Lave (2012c:21) observes "science, and its current insitutional locus – the university – turn out to be surprisingly central to neoliberal agendas" (Mamdani, 2007). Following the decline in public funding of higher education, neoliberalization triggers a number of processes that reconfigure the university. Mamdani (2007) summarizes the processes as privatization and commercialization. The former refers to accepting fee-paying students. The free higher education is eliminated. Under privatization, university priorities are still publicly defined, and it does not lead to changing curriculum in response to market demand. Commercialization, on the other hand, is deeper in which university priorities are defined by the market. Market-driven curriculum and programs are introduced. Zeleza (2016) characterizes these changes as massification – increasing the number of students and degree programs including short course. These changes take a toll on the quality of education.

Neoliberalism shapes research questions and methods selected for answering those questions. Lave (2012b) observes how "particular regimes of science management and funding have

particular and profound impacts on the character of its scientific production" (p. 3). In neoliberal setting, usually the funder will have some say in determining the research topics, methods, and may even exert censorship over the findings. It is perhaps not unusual for choices of environment research topics and emphasis to coincide neatly with introduction of neoliberal policy models. While both applied and basic science research still get funded, neoliberal settings tend to prioritize applied science research (Lave, 2012b, 2012c). Science is produced to meet market needs and not just for the sake of scientific argumentations. Neoliberal reforms thus end up perpetuating the existing scientific order by further blurring the boundary between production, circulation and application of scientific knowledge (Lave, 2012b).

Chapter 3: Methodology

3.1 Research Design

3.1.1 Philosophical considerations

> *Reporter: Do you honestly believe that a dance can make the kind of formations that we need for rain? (following Pathisa's explanation of how Zimbabwean rain dance works).*
>
> *Pathisa Nyathi, Zimbabwean cultural expert: Yes, I will tell you one critical problem with this world. There are people who think that we can understand this world through the eyes of one culture. I don't believe that. This world is too complex to be understood, interpreted by one culture. But what has happened is that there are cultures that think they are superior to others and their views of this world is the view. This has been the problem.*
>
> *Reporter: Which culture are you talking about there then?*
>
> *Pathisa Nyathi: It's western culture obviously.* [8]

In the conversation cited above, Mr. Nyathi argues for plural approach to knowledge, in which diverse ways of knowing are given equal recognition. In our World, the approaches to produce and validate knowledge associated with the western modernization ideal dominate science and the production authoritative knowledge. This is a problem when such scientific knowledge is instrumentalized to control people-environment interactions across the World. This is not to say that western science is bad or that local knowledge is good. The point is that it is unhelpful to think of western science as being universal. The notion of partial and situated knowledge reminds us that "all knowledges are partial and linked to contexts in which it is created" (Nightingale, 2003, p. 77).

This study adopts the science and technology (STS) philosophical commitment to viewing all knowledge as partial and situated to examine the predomination of scientific forestry knowledge in Tanzania's forest management field (Sismondo, 2010). In the STS tradition, scientific knowledge is neither neutral nor a reflection of reality. Scientific knowledge and politics are co-produced – i.e. the production of scientific knowledge is done by people and institutions with interests and motives, and thus it implies the exercise of power (Jasanoff, 2004). Scientific knowledge is seen as a product of the processes that produced it. The framing of a research problem and questions and the choice of methods reflect the social, cultural, and political background of the researcher, and influences what she will see and the conclusion she will arrive at (Ahlborg & Nightingale, 2012; Nightingale, 2003). Research evoking ecological equilibrium and non-equilibrium assumptions, for example, are likely to ask different questions, use different methods, and arrive at different conclusions. Thus, the production and circulation of scientific forestry knowledge is far from being an objective or politically neutral process (Bourdieu, 1975). A scientist is often likely to ask questions that are considered important and of interests in her

field and thus likely to be funded, choose methods that are recognized by her peers, and choose a place of publication that confer the highest scientific authority possible.

In adopting these philosophical commitments, this study connects with the critical political ecology tradition (Forsyth, 2003; Robbins, 2012). Critical political ecology emphasizes how application of scientific knowledge produce winners and losers. It reminds us that the choice of scientific evidence to inform policy processes is political, as shedding light on one aspect of an issue implies that others remain in the shadows and risk being ignored. Thus, research on the conservation impacts of decentralized forestry that builds on remote sensing imagery to show higher crown cover in forests under decentralized management may lend support to the claim that this policy leads to sustainable forest management, while we know little, on that basis, about its impacts on species distribution in the forest or about how the ability of the forest to support local livelihoods needs are developing. STS and political ecology combined produce critical analysis that politicise the production, circulation, and application of scientific knowledge (Forsyth, 2003). The critical political ecology provides narrative of the scientific explanations e.g. whether scientific forestry is relevant to the task of managing natural forests miombo woodlands. At the same time, it undermines scientific explanations e.g. where scientific forestry ideas for managing natural forests came from and in what ways these approaches might be irrelevant.

3.1.2 The case study approach

> *Predictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependent knowledge is, therefore, more valuable than the vain search for predictive theories and universals* (Flyvbjerg, 2006: 224).

This thesis takes a case study approach to the study of reproduction of scientific forestry in Tanzania. Case study is not a method per se but rather a research strategy – delimiting the subject of the study. For a complete treatise of the case study research strategy, including the discussion about the common misunderstandings of case study (and qualitative research), see Flyvbjerg (2006) (also see Denzin, 2011; Lund, 2014).

Case studies have provided important insights throughout the history of knowledge production. Some of the major discoveries ever came from intensive observation of a particular phenomenon – from Galileo's refutation of Aristotelian physics (Flyvbjerg, 2006) to more contemporary examples of important research.

In the book "Imposing Wilderness", Neumann (1998) uses the case of land conflicts in and around Arusha National Park to show that the root of these conflicts can be traced to colonial times when the European ideal of pristine wilderness was imposed. That the conflicts cannot simply be

explained by poverty, population growth, and ignorance often cited by conservationists. Brockington (2002) introduced the concept of *fortress conservation* by examining the case of eviction of people and cattle from the Mkomazi Game Reserve in which he shows that these conservation approaches have more to do with the western views of the environment than the needs of African people and herds (also see Igoe, 2002). To be saved, the landscapes must be devoid of people. Benjaminsen, Maganga, and Abdallah (2009) examine the case of farmer-herder conflicts in Kilosa district (culminated in the killing of 38 farmers in 2000) to challenge the conventional scarcity explanation and instead point to the historical (villagization policy) and political factors (agricultural expansion policy, policy to sedenterize herders etc.) as the cause of the conflicts.

Given the nature of questions this study is asking, in-depth case study is necessary as it allows for a detailed analysis of phenomena under study. In this study, the interest is more on the context-dependent knowledge about a specific and concrete case – the emphasis on technical approaches in Tanzania's forest management field. The aim is not to assess "the magnitude and distribution of the phenomena (i.e. to quantify it) (DeWalt & DeWalt, 2010, p. 13).

Cases are not out there to be found; they are constructed (Lund, 2014). Thus, selection of case study is a choice of what and where to study, which involves deciding what not to study or emphasize (Thomas, 2011). This thesis focuses on the technical framing of participatory forestry in Tanzania and seeks to explain such framing in dispositional terms. Thus, it does so by examining forestry training, activities of forestry academics, and practices of professional foresters. The study sites are thus Sokoine University of Agriculture, Tanzania Forest Service Agency and Forest and Beekeeping Division headquarters, and Rufiji district. In what follows, details of the contexts of the sites where this research was conducted are provided. These contextual materials are meant to help the reader follow the results discussed in the later chapters.

3.1.2.1 Institutions of Forestry Education in Tanzania

To become a professional forester in Tanzania, one can either train as a forest technician at OlMotonyi Forest Training Institute (FTI) in Arusha and/or as a professional forester at the College of Forestry, Wildlife and Tourism (formerly Faculty of Forestry and Nature Conservation) at the Sokoine University of Agriculture (SUA) in Morogoro. Professional forester is here taken to mean an individual who has undergone training in scientific forestry following a defined curriculum and set learning objectives.

Technically, the two institutions are not different in terms of ideas, views, and philosophy about forestry. Most tutors at FTI obtained their bachelor's degrees from SUA and thus they were trained by SUA forestry academics. SUA forestry academics often lead reviews of FTI curricula and sit in committees and the board of FTI. Some of the reference materials (compendium) used at FTI are prepared by SUA academics. Bachelor's degree is important for job promotion at TFS and district councils. So, most FTI graduates would ideally seek to obtain a bachelor's degree and most likely from SUA. Because professional foresters at the forefront of shaping thinking and policies in the forest management field possess bachelor's or higher degrees, the thesis thus focuses on examining forestry academic activities at SUA.

From the beginning, the Faculty of Forestry was offering a bachelor's degree in forestry only. The design of the degree program was such that the emphasis was on the establishment and management of plantations and experimenting with exotic species to meet the national needs of developing industrial forestry (Interview #33). Training and research on indigenous species and non-plantation forests were later incorporated, though it is still dominated by ideas and approaches from plantation forestry. The degree program lasted for three years under the term system. A year was spent to study about seven subjects, write end-of-the-year exam and term papers in between.

Bachelor of Science in Forestry curriculum has undergone several reviews over time with tweaks here and there. A senior forestry academic described changes to curriculum as mostly being "old wine in the new bottle" (Interview #35). Courses such as forest resource assessment, management planning, and silviculture have been part of the curriculum from the beginning. The university changed academic term system and structure of degree programs but not necessarily the contents. Addition of new degree programs offered at the Faculty took place. A semester academic term was adopted in the late 1990s. Academic year was divided into two halves, making a total of six semesters for a three years' degree program. Instead of attending a year of instruction and sit for an exam at the end of the year, students are now attending classes for less than six months and doing examinations at the end of semester before embarking on new subjects in the subsequent semesters. Semesterization was part of the efforts to make degree programs more attractive and compatible to the prevailing market conditions (Shivji, 2006). This was considered necessary for the university to remain relevant. Summarizes the admission requirements for Bachelor of Forestry offered by SUA.

Table 1: Admission requirements – Bachelor of Science in Forestry, SUA[9]

Bachelor of Science in Forestry:	**Direct entry:** Advanced Certificate of Secondary Education (ACSE) with two principal passes in biology/botany and chemistry or physics/geography. **Equivalent/indirect entry**: Diploma in forestry, beekeeping, wildlife management or agriculture (with forestry component) with a GPA higher than 2.7. And Certificate of Secondary Education (CSE) with three credits or four passes in relevant science subjects. **Recognition of prior learning (RPL):** Completed at least standard seven; Attended extramural or professional development courses; Working Experiences; Age at least 25 years; Pass RPL examination B grade and above.

The public funding to higher education in Tanzania has been declining (SUA, 2015a, 2016). Efforts to respond to the declining public funding by aligning the university education and research to the market demand received a major boost in 2014. The university council approved a major restructuring of the university organization and management structure. Other higher learning institutions in Tanzania are now undergoing similar restructuring. The aim of the restructuring is "to increase efficiency, effectiveness, and visibility as well as generating more revenue to the university" (SUA, 2015:1) . Faculties (academic units) are becoming schools and colleges. The Faculty of Forestry and Nature Conservation is now College of Forestry, Wildlife, and Tourism as of 1 July 2016 (SUA, 2016). Related departments, institutes, and centres from across the university are merged and/or restructured to create new colleges.

At the new College of Forestry, Wildlife, and Tourism, departments have been reorganized and renamed (SUA, 2016), perhaps to reflect the lingua franca of the market. For example, forest biology department is now a department of ecosystems and conservation. The number of undergraduate degree programs to be offered is 19, up from the current three. Additionally, 20 MSc (up from existing 10), 6 PhD (up from the existing PhD in Forestry), and 5 non-degree programs are proposed. The new college is offering a wide-ranging degree programs covering both the traditional renewable resources and non-renewable resources including an undergraduate degree in petroleum and natural gas economics – perhaps to tap opportunities presented by oil and gas discoveries in the country. Also, stand-alone bachelor's degrees in community forestry, forest resource assessment and management, and commercial and urban forestry are proposed. As for the other colleges at SUA, the aim is to fulfil university's ambition of increasing enrolment and boost revenue collection by offering what the market wants.

The restructuring sets off competition for students amongst higher learning institutions in Tanzania. Several public and private universities and colleges are now offering similar degree

programs as SUA. University of Dar es Salaam has introduced a degree programs in agriculture, which were once left for SUA to offer.[10] College of African Wildlife Management is offering degrees in wildlife management and tourism, competing squarely with SUA for students. SUA is also responding by introducing non-traditional degrees in fields such as humanities and laws. Because not all the degree programs are considered a priority for loan (TCU, 2015), universities must offer loan-priority degrees to stand a chance of attracting students and generate income.

3.1.2.2 Forestry Bureaucracy: Local Government Authorities and Central Government Departments

In order to apply forestry science, its principles shall be formalized through policies, legislations, and guidelines. Forestry and Beekeeping Division (FBD) and recently Tanzania Forest Service (TFS) under the Ministry of Natural Resources and Tourism (MNRT) are the two institutions charged with formulation of forest policies and ensuring effective forest management in the country. The people at the forefront of shaping forest management in Tanzania are based at MNRT headquarters in Dar es Salaam. Thus, this study spent a lot of time interacting with foresters and examining practices at FBD/TFS headquarters. Rufiji District in Pwani Region was chosen to get a feel on how scientifically framed participatory forestry plays out in practice.

3.1.2.2.1 Rufiji District

Rufiji district (8°0'0" N and 38°40'0" E) is located in the south of Pwani Region, with an area of 13,339 square kilometres (Durand, 2003).[11] Of this, 38% is forest reserves and Selous Game Reserve. Agriculture is the main source of income for residents who also rely on the surrounding forests for honey, timber, firewood, and grass for thatching (MCDI, 2013). Rufiji District and the Pwani Region is rich in forest and one of the active districts in implementing PFM approach. As of 2012, the region had a total 42 declared VLFRs and three gazetted VLFR (MNRT, 2012). CBFM activities are currently active in the following villages: Nyamwage (1294 ha), Yelya (1200 ha), Tawi (2787 ha) and Mtanza-Msona (9544 ha of which 6000 ha is set aside as production forest) (Interview #51). Nyamwage and Tawi villages are under Forest Stewardship Council (FSC) group certification scheme sponsored by Mpingo Conservation Development Initiative (MCDI), a local NGO based in Kilwa district. Rufiji district has a long history of receiving donor funded environmental conservation programs from donors and NGOs such as the World Bank, the Netherlands, Finland, WWF, and IUCN. The district was among the priority districts in the National Forest Program that received PFM funding from multiple donors. Despite concerted efforts involving multiple partners and donor support, none of the villages participating in CBFM

in Rufiji has been able to sell any timber for lack of certified hammer to mark timber as legal and certified for sale as of March 2015 (Makala, J., Personal Communication, 9 March 2015).

The district is active in implementing CBFM activities and offers a good example of the challenges facing community forestry. The forest section at the district council is manned by only two foresters who are responsible for coordinating all PFM activities in the district in addition to managing 16 national forest reserves (before the arrival of Tanzania Forest Service Agency) and three district forest reserves. All these reserves have no management plans. For non-PFM forests, the responsibilities of the two foresters are to supervise harvesting, tree planting, and issuance of permit and transit pass. The District Forest Officer (DFO) also served as a secretary for the district forest harvest committee before the arrival of TFS. When asked about his role and challenges faced, the DFO said,

> I am also responsible for ensuring sound forest management in the district. For forest under no management at all, we try and put them under PFM. But due to inadequate funding/resources, forest management in Rufiji is not in a good state (Interview #51).

3.1.2.2.2 Ministry of Natural Resources and Tourism (MNRT)

Forest and Beekeeping Division (FBD) is one of the five departments under the Ministry of Natural Resources and Tourism (MNRT). For much of the post-independence period, FBD was responsible for directing forest management in the country through policy formulation and implementation. FBD was also responsible for the management of forest reserves, forests on general land, PFM coordination, and plantations. After the approval of National Forest Policy in 1998, discussions about institutional reforms and creation of Tanzania Forest Service (TFS) started to dominate forestry circles in Tanzania.[12] FBD was encumbered with meagre funding, donor dependency, ineffective revenue collection and use, poor governance, and lack of accountability and supervision. It was thought that the establishment of executive agency to oversee forest management in the country would solve these constraints. Funders such as the World Bank supported these reforms. It took about a decade to realize this goal.

When TFS came into operation in 2011, FBD temporarily ceased to exist because it was left with no staff. TFS inherited everything and everyone at FBD except for PFM portfolio. For about two years, PFM activities lacked proper coordination because TFS is not mandated to do so. Since a structure was needed to coordinate and oversee all forest managers in the country including TFS, village governments, and private companies/individuals, FBD was staffed again. FBD has a staffing level of no more than 20 professional foresters and handles policy

formulation, monitoring of policy implementation, planning, research, forestry training, quality control of forest and beekeeping, and participatory forestry.

According to its establishment order, TFS is an executive agency created "to take over the day to day management of the national forest, bee reserves and forest and bee resources on general lands" which were under the responsibility of the FBD (URT, 2010). Thus, TFS manage about 455 forest reserves, eight forest nature reserves, and 15 forest plantations covering over 14 million hectares. TFS is also responsible for the management of forests on general land estimated to cover over 2.7 million hectares. Figure 2 shows forest sizes by land ownership and management strategy. An important thing to note here is that even though forest reserves (including national parks and game reserves) is an old forest management strategy, more forests are found on village land and general land. This makes CBFM even more urgent because it is now considered politically costly to move people and declare new government managed reserves.

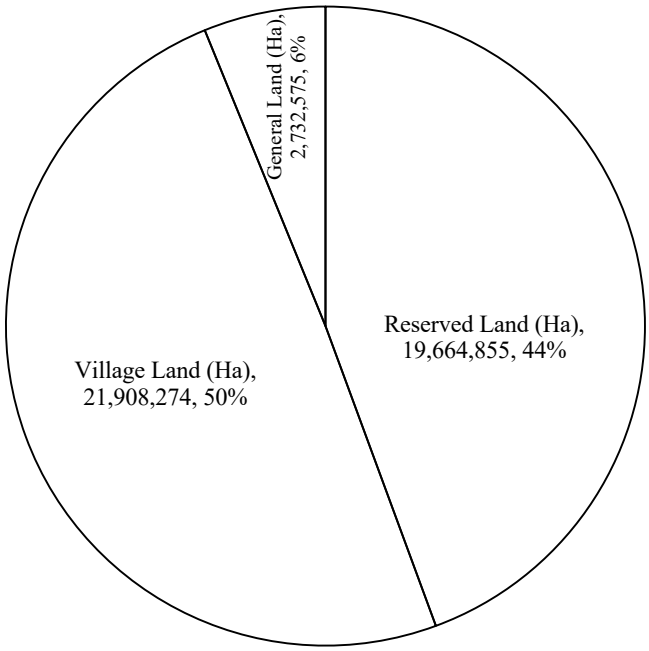

Figure 2: Forests by land ownership. *Source: (URT, 2015)*

Chief Executive Officer is the head of TFS. Three directors heading the directorates of resources management, planning and resources utilization, and business support services are assisting the CEO. Furthermore, the TFS has divided the country into seven administrative zones, each with a zonal manager. In each district, there is a District Forest Manager (DFM) who oversees TFS activities in a district including forest harvesting and collection of revenues. In total, TFS boasts a staffing level of a little over 1,800 in which 852 are technical staff (725 forest officers, 127

beekeeping officers), 773 forest attendants, and 198 supporting staff. TFS seeks to increase its staffing level to 4,000 "for effectiveness and efficiency" (TFS, 2014).

3.2 Methods employed

Qualitative research methods were employed to examine the reproduction of scientific forestry through education, activities of forestry academics and management practices. The empirical data were collected over a period between May 2015 and July 2017. Semi-structured/unstructured interviews and conversational interactions were conducted with over 100 respondents. The respondents included central government foresters, district forest officers, international technical advisers, forestry academics, forestry students, villagers, and staff at foreign embassies and NGOs. Eight workshops drawing over 150 participants from all these group of actors, including timber traders and local communities, were observed. The workshops considered different topics including volume determination methods and other barriers faced by timber traders, national forest program, sustainable charcoal, district management plans, and CBFM. Lave (2012) used the similar methods in her analysis of the US stream restoration field drawing on Bourdieu's concepts of field and habitus. Bourdieu relied on observing practices in his own fieldwork studying the Kabyle people, an ethnic group in Northern Algeria, (Bourdieu, 1972, 1990).

3.2.1 Participant Observation

In participant observation, as the name suggests, a researcher participate in activities, observes, and records the observations (DeWalt & DeWalt, 2010). Records of observations are data that can be analysed to generate insights about the question under study. Observation and/or participant observation is a major research method in anthropology and sociology (Kawulich, 2005). While I was able to participate in and observe interactions, lectures, and workshops, it was not possible to fully participate in activities at the forest department as a typical employee would do (see section 3.2.5). It was also not possible to participate in all the training activities for three years as a typical forestry student would do. But as an undergraduate and a PhD student at SUA, I had the opportunity to experience first-hand the forestry pedagogic action.

The process of approving my own PhD proposal was revealing. It conjured the forestry academics who reviewed and examined my proposal to react to the idea that scientific forestry can be questioned. Or that they can be subjects of a research. The criticisms and comments I received on my proposal revealed the worldviews and perceptions of forestry academics.

The training of undergraduate forestry students was observed. I followed lectures and interacted with third year students' class of 2015 during their two weeks field practical training in July 2015.

The practical training in July 2015 covered courses in forest roads, financial accounting, law enforcement, and extension. I also followed lectures and interacted with second year forestry students (class of 2016) for three weeks during their forest resource assessment practical training at SUA Training Forest in OlMotonyi, Arusha. Around the same time, I visited FTI campus several times and interacted with tutors and students. On top of lectures, practical training sessions involved actual forest inventorying of plantation forests of exotic species. As a group member, I participated in all activities with my fellow students. In completing group assignments, I interacted with students informally, bringing up different topics for discussion. This enabled collecting data on the students' views about various aspects of forestry, forestry training, forest management, and their future career plans. The observation of lectures and interactions with students afforded access to the nuances of the forestry pedagogic action.

To gain insights into expert activities of forestry academics, I observed workshops including short courses hosted by forestry academics. I observed a total of five workshops where forestry academics either took the lead or played a significant role e.g. served as authority on matters being discussed. These were useful as it revealed the sort of ideas and views that they brought to focus and those that they censored out.

To gain insights into rationale underlying the contradictory framing of and actual forest management practices, I observed practices of District Forest Officer (Redford, Padoch, & Sunderland) in Rufiji district and those of forest officers at Forest and Beekeeping Division and Tanzania Forest Service Agency. I spent a month at DFO office in Utete, Rufiji district and observed his interactions with the leaders of Nyamwage and Tawi villages who were trying to implement some harvesting in their VLFRs. They faced hurdles including the requirement that a special hammer must be sought and obtained from the Director of FBD to mark logs and timber originating from VLFRs before harvesting can go ahead. I had encounters with the village leaders and officials from an NGO supporting them in the process. I heard their account of the struggles to obtain the hammer and interactions with DFO. Further, I witnessed DFO's struggles to organize a repeat forest inventory in Mtanza-Msona VLFR.

I secured the permission to work as an intern at the TFS headquarters. But that plan did not materialize as I were not assigned duties. Nonetheless, I was able to 'hang out' in the TFS and FBD offices. I reported to office daily for no less than two months continuously and intermittently for two more months. To excavate the implicit categories spawning practices, I observed practices and interacted with professional foresters, mostly informally. I travelled with forester to workshops. Unlike formal interview settings, workshops presented a platform where professional

foresters debated issues amongst themselves and their stakeholders, which was more revealing of their thought processes, beliefs, and strategic calculations.

3.2.2 Semi-structured interviews-cum-conversational interactions

Semi-structured interviews were employed to explore issues and themes emerging from observations of practices and study of documents (Galletta, 2013). Forestry students, forestry academics and forestry officials were interviewed. Semi-structured interviews started with general things to learn about respondent's experience with technical forest management. Drawing on interviewee's responses, interviews proceeded by asking more specific questions in efforts to drill holes into respondent's views, beliefs, commitment (or lack of) to scientific forestry and justifications for it. Then contradictions in responses were explored. Sometimes, the same respondent was interviewed repeatedly at different times to gauge the extent of commitment to scientific forestry. Some respondents chose to do interviews off record.

Interviews also took the form of conversational interactions with forestry and non-forestry academics at SUA on topics related to forestry, curriculum, organization of higher education, research, and consulting. In conversational interactions i.e. "informal interviewing/casual conversation among acquaintances". the aim was to "exert only a minimal impact on the topic and flow of the interaction ..and gain insights into the point of view of the participants" (DeWalt & DeWalt, 2010). Interviews, especially informal interviews, were not a one-off event: they often involved discussing with the same individuals over and over again. This approach enabled unearthing forester's worldviews and dispositions. I relied on conversations - either initiated by me or my interlocutors – resembling 'hearsay ethnography' described by Watkins and Swidler (2009). The conversations enabled me to assume a position of 'cultural insider' and that they were fairly open in my presence. If foresters wanted to question scientific forestry, I have no reason to believe that they would not do so in my presence. But I also have no reason to think that foresters discussed in my presence the sort of things they didn't want me to know e.g. illegal deals.

In conversational interactions, I would randomly bring up a topic of interest to my research over lunch or any other meet up with academics and students who already knew about my research. In other cases, I would quickly introduce my research and things I am interested in before posing my question in an informal setting. These were off record and casual. When an interview is pre-planned and recorded, people tended to be more careful and formal in responding. This introduces a risk of respondents telling only what they think are "correct answers", for example answers that will preserve the public image of the university. As Mathews (2005) points out, scientific forestry knowledge is not necessarily accepted or internalized just because it is not questioned in the open.

It was thus important to get "backstage transcripts" in order to see whether respondents questioned/reflected upon the established scientific forestry or their support for the knowledge was genuine.

Formal and informal interviews with professional foresters and technical advisers at the MNRT headquarters were conducted mainly as a way of diving into the details of observations. For instance, after observing that TFS was keen to evict people who have settled in forest reserves, interviews/conversations with foresters at the forefront of the exercise were aimed at looking for insights into their perceptions, conceptions, and justifications for the practice.

Officials at the embassies of donor countries in Dar es Salaam and technical advisers of donor funded projects were also interviewed to gain insights as to why and how donors choose to support technical framing of PFM in Tanzania. To delve more into the PFM funding landscape, NGO staff were interviewed for their role in implementing PFM activities and shaping funding priorities. On this, the study benefited immensely from my own experiences with working for NGOs and good relationship with staff currently implementing programs for NGOs and who often takes part in fundraising. Narratives of negotiations for donor funding offer rare insights into how funding priorities are arrived at, which in turns shape practices within the forestry sector. Non-academics consultants active in the sector were also interviewed. Some of these consultants had at some points worked as technical advisers for donor-funded programs and program officers at embassies supporting forestry activities before becoming consultants. Because most of the detailed and expensive forest inventories would not have happened without donor support, understanding the thought processes and practices that influence what is funded was important. Donor funding is thus in some ways responsible for reproducing scientific forestry in Tanzania.

3.2.3 Study of documentary sources

Numerous documentary sources about forestry education and activities of forestry academics were collected and studied. To understand the contents, structure, and spirit of materials taught in forestry education, detailed study of the curriculum for the bachelor's degree in forestry offered at SUA was conducted. The curriculum for the Basic Certificate in Forestry, Technician Certificate in Forestry, and Ordinary Diploma in Forestry offered at FTI was also studied. The curriculum reflects knowledge and skills students are expected to learn and the worldview they are expected to acquire. It specifies relative weight/units and learning objectives for each subject. Curriculum guide lecturers on what they should teach at the minimum, time allocations for lecturers and field practical lessons, assignments, seminars, and references/readings for each subject. Syllabuses and class notes for various subjects were also studied.

Data used for the analysis of academics' research come from both the in-house and 'high impact factor' journals. The list of forestry academics at SUA's departments of ecosystem and conservation are (formerly Department of Forest Biology) and Forest Resources Assessment and Management (formerly Department of Forest Mensuration and Management) were obtained. These departments are core to the forestry discipline. The list is comprised of a total of 20 academics (9 Professors, 3 Associate Professors, 3 Senior Lecturers, 4 Lecturers, and 1 Assistant Lecturer). The Web of Science/Knowledge was searched by author and retrieved the publications by each academic. The prioritized research questions and topics reveal the censorship applied in terms of questions and topics not asked.

It was not possible to access all the consultancies ever completed by forestry academics themselves and/or in collaborations with non-academics. At the college, consultancies are either organized through FORCONSULT – the college consulting bureau or directly between faculty and the client. While it was possible to access some of the FORCONSULT consultancy reports, it was a challenge to obtain consultancy reports completed by individual faculty through other arrangements.

In the language of texts, forestry practices are made available to the analyst as they reveal the beliefs, desire, preferences and biases of professional foresters. Numerous documents were thus collected from the forest departments, technical advisers, and NGOs. These included traditional ones like policies, legislations, regulations, guidelines, and reports. Project documents, progress reports, consultancy reports, and dossiers detailing issues related to volume calculations. NGO reports, presentations, and policy briefs were also collected and analysed.

3.2.4 Data analysis

Data collection and analysis proceeded concurrently. An iterative approach was employed in which I reflected on the information as they became available, exploring for emerging questions, argument, and contradictions in connection to existing theories and ideas under study. This approach allowed for continuous fine-tuning of research problem and questions. It also allowed for the verification of emerging findings through repeated conversations to establish the extent to which scientific forestry is instrumentalized (i.e. consciously rendered as an instrument for pursuing personal profits and domination with little regards to its relevance for forest management) and/or taken for granted.

Observations, semi-structured interviews and documents produce data in the form of texts – field notes and interview transcripts. So, analysis involved scouring for meaning, patterns, surprises, contradictions, and silences in the textual data guided by research questions and theory. Analysis

of textual data involved tracking emerging themes and digging for the underlying assumptions until when no new information came up. It took the form of establishing whether foresters understand the flaws inherent in the scientific forestry model, reflect on them, and thus willing to rethink the model, and accept that the model may not best approach to all kinds of forest management.

Academics' publications were organized by year and imported into Nvivo[13] for analysis. Analysis involved text – mining (text search and word frequencies) and qualitative analysis (exploring the themes for key narratives) (Mårald, Langston, Sténs, & Moen, 2016). A total of 139 publications were retrieved from the Web of Science/Knowledge, published between 1984 – 2017, and comprised of original research, letters, reviews, and conference papers. Single authorship is rare, virtually non-existent. Most of the papers are co-authored and professors are not usually lead authors. Out of 139 publications, only 13 were published on or before 1990. This suggest that the preferred place of publication then was in-house journal, the Faculty of Forestry Records.

The last issue of the Faculty of Forestry Records was published in 2004. By then a total of 72 papers had been published in the journal. Adding papers published in the succeeding Tanzania Journal of Forestry and Nature Conservation, the total number of papers published in the in-house journals is over 173. Some faculties who were around when the Faculty of Forestry Records was started in 1978 are still around today. These faculties and the journal played a pivot role as architecture of forestry in post-independence era. Further, these academics still command authority based on seniority.

3.2.5 Constraints, Reflections, and Ethical Considerations

> *"To endeavour to think the state is to take the risk of taking over (or being taken over by) a thought of the state, i.e. of applying to the state categories of thought produced and guaranteed by the state and hence to misrecognize its most profound truth" (Bourdieu et al., 1994, p. 1).*

The quote above serves as a reminder that because I was educated in government institutions and worked for the government and thus potentially acquired the categories of thought approved by the state, there is a risk of thinking like a state and miss out on its true nature. I would have fallen victim of this had I not been made aware of it and not exposed to the political ecology research tradition that emphasizes on, among other things, self-reflection on the part of the researcher.

Studying the state pose a challenge – one of studying professionals enabling the work of the state. Mosse (2011) discusses these challenges using examples from his own study of development professionals. The texts produced in the study of professionals "circulate within

the same public space as, and compete with, the representations of their informants" (Mosse, 2011). Professional subjects' reaction to the work of a researcher can be a research strategy in itself, producing some valuable data. At times, these reactions go beyond the realm of differences in "epistemologies and frame of references" and become objections. When professional subjects object to research findings or researcher's description of them, they are basically asking for consent not only for their participation to the study but also "consent to editorial or control of findings". They are basically demanding for interpretive consensus. In this case, consent rule can be misused "to evade social science scrutiny, resist critical analysis, gain control over research and protect reputations and public images of success" (Mosse, 2011, p. 51).

This thesis was partly completed at the College of Forestry, Wildlife, and Tourism, SUA. Thus, among the primary audience for this research are forestry academics at the College as examiners. The thesis focuses on forestry academics' teaching, research, and consulting activities for its role in crafting subjectivities. As such, forestry academics serve both as subjects and examiners. This thesis is not quite a case of "insider" research because I am not part of the forestry academics but it poses similar challenges as those described by Mosse (2011). The challenges were related to those of assuaging tension and maintaining relationship with forestry academics especially when they found my research is asking annoying questions – those that appeared to challenge the dominant views.

Differences in epistemologies and frame of references were evident. Methods employed in this research are quite different from the common approaches used by most forestry academics. I employed qualitative methods while forestry academics, most of them being natural scientists, have penchant for quantitative methods and statistical analysis. Even where they apply qualitative methods, they do so to generate hypothesis to be tested quantitatively or to generate descriptive accounts to enrich quantitative accounts and never as a full-fledged research protocol. My audience, forestry academics, do not fully approve of qualitative research for its lack of statistical analysis. They questioned (objected) to my choice of classrooms and forestry bureaucrats' offices as study sites arguing that there is not much to be learned in these places as actual implementation happen in villages. Some forestry academics did not approve of the idea that they, their students, and professional foresters can be subjects of research. They only saw villagers as subjects of research on PFM topic, perhaps trying to evade social science scrutiny of their work. This posture can be traced to the dominant view amongst professionals that if there is any problem with PFM, it must be related to villagers' inadequate technical capacity and poor implementation. This amounted to attempts to change my research questions and strategies.

There was also elements of asking for consent to editorial or control of findings. Questioning the relevance of scientific forestry in participatory forestry created tension. The use of words such as paradox, domination, belief, forest exploitation, and contradiction in defining my research problem were questionned and/or objected to by forestry academics who argued that these words either mirepresent the reality, carry negative connotation and/or reflect some unacceptable preconceptions. A professor refused to continue reading my research proposal after spotting the word paradox in the title used to describe the disjoint between the framing of PFM and the stated outcomes. He argued that the word paradox suggests there is an alternative to scientific forestry while he could think of none. He demanded that the word paradox be removed before he could continue to read the rest of the proposal. Some of these academics played a pivotal role in the framing and development of PFM to what it looks like today. In some intances, forestry academics have sought to force consent to editorial or control of findings by leaving behind notes during seminars with messages such as "we should notallow the candidate to go out there with information that will distort the image of SUA and college". Others advised that it is not necessary to report on everything I have found in my study, suggesting potentially damaging information to the reputation of academics can be safely axed out. They tried to preserve their reputation and public image and those of institutions they belong to.

Since I was aware of the sort of censorship that can be imposed, I dealt with these challenges mainly by arguing my cases and persuading my interlocutors when I sensed that some sort of censorship was being applied. I also incessantly and carefully considered whether including the materials carried the risk of harming the subject, the group of subjects, or some organizations. Luckily, I did not encounter a situation in which my interpretation of events "ruptured my professional and personal relations", even though it sometimes required "re-negotiation of relationships or tension" (Mosse, 2011). This mainly took the form of long discussions and often things were resolved by agreeing that we see the world differently (the epistemic and interpretive differences).

At the FBD/TFS, the original idea was to "swim in the stream of action and filter out its composition" (Wacquant, 2014:123). For that the intention was to work as intern at TFS. My application was accepted and permission to work and interact with foresters was granted. The Chief Executive Officer (CEO) of TFS assigned two senior foresters to work with me. The senior foresters I was assigned to work under either couldn't understand the idea of doing internship as a methodological strategy or they just refused to subscribe to the idea. They simply kept on promising that they would put me to teams working on particular assignments. My previous

employment at the Wildlife Division under the MNRT meant that I knew a few people at TFS/FBD and Rufiji district from previous interactions. While this facilitated access to the sites, still the officers were just not comfortable to assign me duties. They kept on looking for appropriate tasks as others were considered too sensitive (and therefore demanding confidentiality) for me to take part in. The closer I got to realizing the idea of working as an intern was to travel with foresters to meetings. Perhaps, the idea of interning was overambitious. I had to resort "to scoping from the river bank" (Wacquant, 2014:123). This approach worked quite well. Foresters were willing to have me around their offices, talk, debate, and share documents. In their informal gatherings in their offices, foresters shared rumours, jokes, and recounted past experiences. Through my presence among foresters' informal gatherings, I learned a lot about things I would not have asked about in formal interviews. Through grapevines, I got access to forester's thinking that would not otherwise be revealed in public i.e. hidden transcripts.

One key lesson from my fieldwork is that informal interviews/conversational interactions were particularly effective in getting respondents to open up and share their views more candidly. Informal interviews/conversations were often impromptu and off-record. I often met foresters in the corridors of the ministry building, introduced myself, and my research. When I realized I could learn a thing or two related to my research from these people, I possed a question and conversations ensued. Countless conversations relevant to my study were initiated by foresters themselves. People said less and were more careful in addressing controversial issues when interviews were pre-planned and recorded.

Accessing the study sites followed official channels. I wrote to the Dean, Faculty of Forestry and Nature Conservation (now College of Forestry, Wildlife, and Tourism) detailing my study and requesting permission to interact with forestry academics and students. The Dean in turn introduced me to all forestry academics at the faculty. To access TFS/FBD and Rufiji district, I had to request for a letter of introduction from the Vice Chancellor of SUA. During observations and interviews, I sought to obtain consent of research participants. I constantly reminded subjects about my research and my status as a researcher and that all the collected materials will be used for the purposes of research only.

Positionality refers to the "social roles assigned within research" (Humphries, 2012, p. 114). My earlier experience as a staff at the Ministry of Natural Resources and Tourism and WWF Tanzania gave me generous access to the forestry bureaucracy. My studentship at SUA, previously as an undergraduate student and this time around as a PhD student, taught by the same professors in

both occasions eased my access to the forestry college at SUA. Further, I speak the languages (Kiswahili and English) of research participants. All these allowed me more access to the everyday acts of meaning making in these sites than it would be possible for a complete stranger to achieve. I had access to conversations and grapevines. While I was able to assume a position of a 'cultural insider' (Watkins & Swidler, 2009), my interlocutors still kept my role of a researcher and thus an outsider – they did not freely discuss the things they didn't want me to know in my presence. But my position not as a total stranger and with acquaintances and friends in the study sites, I was able to find where to press and elicit more genuine meanings ascribed by research subjects to what was happening around them.

Chapter 4: Setting the Scene: Scientific Forestry and its Challenges

4.1 Scientific Forestry: What is it exactly?

Much has been written about scientific forestry – its meaning, history, and attendant evils (see for example Hurst, 2004; Lang & Pye, 2001; Larson & Ribot, 2007; Lowood, 1990; Lund, 2015; Mathews, 2011; Nightingale, 2005; Perry, 1998; Scott, 1998; Sunseri, 2009). Hansen and Lund (2017, p. 4) define scientific forestry as involving a set of practices in which,

> "…forests are demarcated (enclosured), measured and growth rates modelled to yield predictions about how they will respond to different management options. The growth models should, in principle, build on detailed knowledge of the ecology of individual tree species, their regeneration, growth, and flowering and seeding in response to different soil, moisture, and light conditioning. This would allow forest managers to control, predict and manipulate the development of forests to yield desired tree species in appropriate sizes".

Activities core to scientific forestry are demarcation, measurement, modelling, and management of forests mainly for timber. It is predicated on the assumptions about the possibility of scientifically manipulating and controlling trees and forests to obtain the desired outcomes e.g. a particular species composition and trees of certain sizes. Manipulation of trees to achieve a defined management objective(s) involves the science of nursery, planting, and management of forest stand. It involves silvicultural practices such as selection of species to plant and where to plant, selection of seeds to use and breeding techniques, and what spacing to use to get trees of a given size and maximize yield. It also involves control of competing vegetation, soil treatment – fertilization, and stand protection – control of insects, diseases, fire, and wind. Genetics also comes in – which entails selections of trees in the field with the desired characteristics and propagate them i.e. interbreeding. Stand management also entails silvicultural practices such as thinning and prunning.

Traditionally, scientific forestry as invented in the late 18th century by Germans and introduced in Tanzania (then Tanganyika) by German colonists, was designed as cameral science to manage trees and forests for fiscal purposes.[14] Because natural forests did not lend themselves to the aesthetics of scientific forestry, they were replaced by monoculture plantations of fast growing species (Scott, 1998). But still these ideas are now being applied in the management of natural forests of slow growing species for various purposes including carbon stored in trees but also timber. The colonial ideas of state obsession with managing forests for fiscal purposes are yet to go away and are now extended to uncharted territory of trying to separate people from forests they depend on. Prioritizing on timber means that little considerations go into ecological processes and functions and sustainability is on focused on utilization. This approach to forestry

sees forests as a population of commercial trees (and by extension carbon) as opposed to a complex ecosystem providing varied goods and services including local uses of forests and woodlands (Kimmins, 2004).

Scientific forestry is a body of knowledge and ideas. It is also a "political-economic system for resource control" (Peluso 1992, p.237). In *Seeing like a State*, Scott (1998) argues that scientific forestry is an example of state's preoccupation with high-modernist ideologue – the faith and belief that a better society is the one organized according to some scientific laws. That scientific forestry exemplifies the state fondness for aethetic and order and for making society legible with the aim of simplifying the task of government. Citing numerous studies by prominent scholars and spanning different regions of the world, Klooster (2002, p. 44) writes,

> "Scientific forestry requires a high level of social and spatial control; favors national interests over local ones; stresses industrial raw materials like pulp or sawmill timber over other forests uses; and discourages agricultural clearings, burning, woodcutting, and grazing. It often result in institutional failure and social injustice".

Among the justifications given for scientific forestry is sustainable forest management, which often means non-declining supply of forest products for fiscal purposes. The preoccupation with growth rate of diameter at breast height and volume rather than length of each branch for instance confirms the role of scientific forestry in maintaining collection of revenue. The core activities to scientific forestry entails that "forestry experts" are to manage the forests, "forest crimes" are to be stopped, and village people's access to the forests is to be limited, particularly if access is seen to threaten the state's income from the forests" (Lang & Pye, 2001). It entails discouraging or prohibiting local uses of forests (in favor of timber and carbon) as they are considered unsustainable. From scientific forestry point of view, grazing and clearing forests for food production are destructive activities as they stand on the way towards sustainable forest management. Usually, these prohibitions are institutionalized in form of prescriptions contained in forest management plans.

Further, invoking scientific forestry necessarily involves relegating other forms of forest management. Viewing grazing as unsustainable practice entails relegating knowledge pastoralists may have about the woodlands. Local communities are thus seen as obstacles and ignorant of the importance of sustainable forest management. These approaches are grounded on Western vision of the environment and are based on the premise that local communities have destroyed (and are destrying) the forests (see Brockington, 2002). The ways in which local communties have taken care of woodlands are effectively overlooked. Through scientific forestry, state imaginations and aesthetics are brought to bear upon rural communities who are

dependent on woodlands for their livelihoods.

The use of the phrase scientific forestry does not mean that other forms of forest management are un-scientific. The use is intended to achieve a distinction between scientific knowledge (externally sponsored) favoured by the state and professionals and other locally produced forms of knowledge. While local forest knowledge could also be scientific i.e. a product of experimentations, scientific forestry of professional foresters is calculative involving documentation and measurements in accordance to ideals of Western culture. It is the scientific forestry knowledge produced by forestry scientists and taught in professional forestry schools. Local forest knowledge (variously known as indigenous knowledge), on the other hand, is based on experiential learning and is passed down generations through stories and practical experiences of interacting with woodlands.

4.2 Challenges to Scientific Forestry

Much as it enjoys supremacy in forest management, scientific forestry is not without challenges. Here, three main sources of challenges to scientific forestry ideals are identified and discussed. These are chaotic ecology assumptions challenging the equilibrium thinking dominating forestry planning and restoration ecology, inadequate ecological knowledge at species level, and practical constraints inhibiting implementation of ideal form of scientific forestry. These are described in turn.

4.2.1 Challenges from Non-equilibrium ecology

In December 2014, the author of this thesis defended the doctoral research proposal in a refereed seminar at SUA. In attempt to point out some flaws with inventory-based forest management plan for natural forests, the author happened to mention that forest planning is based on disputed equilibrium ecology assumptions. That comment turned out to be controversial. A professor in the audience countered, "*in doing inventory and drawing up management plans, we do not make any assumption. Where did you get this equilibrium ecology assumption thing? You are making things up*." This suggest that thoughts from non-equilibrium ecology are yet to enter into SUA forestry academics lexicon.

In this section, I attempt to briefly survey thoughts from the so-called non-equilibrium ecology and highlight on how they pose a formidable challenge to the equilibrium thinking dominating conventional ecology predicated on stability in nature assumption. The aim is not to discredit or elevate any ecological camps over the other but to show diversity in thinking about nature and

why treating what we know as a reflection of reality while ignoring opposing views may be a bad idea. By doing so, we run the risk of passing unwarranted oppressive policies based on incomplete information, which carries moral and ethical dimensions.[15]

In ecology, a community is an assemblage of plant and animal populations of different species that live in a particular area or habitat. These populations of various species in a community interact amongst themselves and with the abiotic environment to form ecological system with its own properties. An ecological system (ecosystem) exhibits processes e.g. competition that give rise to patterns. Community ecology is concerned with explaining the underlying mechanisms/processes that give rise to and maintain biological communities. For the most part of efforts to explain these underlying processes, the *balance in nature ideas or equilibrium thinking* dominated. In 1864, George Perkins Marsh declared "nature, left undisturbed, so fashions her territory as to give it almost unchanging permanence of form, outline, and proportion, except when shuttered by geologic convulsions; and in these comparatively rare cases of derangement, she sets herself at once to repair the superficial damage, and to restore, as nearly as possible, the former aspect of her dominion" (Marsh, 1864 *cited in* Forsyth, 2003:64 and Scoones, 1999: 481). Marsh conceived of an ecological system in equilibrium, unchanging, permanent state and even when disturbed, it will undergo a recovery process to return to its original steady-state/equilibrium state it was before disturbance. Holding all external factors constant, an ecological system is a self-regulating system.

Plant succession theory is grounded on the stability in nature thinking. In 1890s, Henry Chandler Cowles based on his studies of Indiana dunes proposed the ideas of plant succession and climax formation (Connell & Slatyer, 1977).[16] In 1916, Frederic Clements formalized the ideas of plant succession. Plant succession is a theory of how plant communities create the conditions for other plant communities to succeed them in a given place, i.e. pioneer tree species colonizing an open area and creating the microclimate that allows more shade tolerant tree species to establish themselves and gradually outcompete them. The theory holds that all plant communities are in succession which terminate at climax community – a stable plant community that will not change in the absence of fundamental changes in growing conditions, i.e. changes in climate, soil or disturbance levels. Clements wrote "each stage of succession plays some parts in reducing the extreme condition in which the sere began". Sere is a stage in succession and thus we talk of seral stage: "a characteristic sequence of biotic communities that successively occupy and replace each other in a particular environment over time after either disturbance of the original community or the formation of new, previously uncolonized environment" (Kimmins, 2004). Clements adds, "Such a climax is permanent because of its entire harmony with a stable habitat".

Note that plant succession theory is premised on equilibrium thinking in which a climax community is self-regulating and in absence of disturbance, it is permanent. Even where there is a disturbance, a system sets itself on a succession sequence to *return to its original steady state*. Further, plant succession theory assumes that there is order in nature – seral stages that follow predictable patterns and directions. Since orderly and predictable succession towards some known climax community is expected, ecologists invoking equilibrium view of nature talk of arrested succession – when a different species than the one expected take over a cleared area for example (see for example Chapman, Chapman, Kaufman, & Zanne, 1999; Paul, Randle, Chapman, & Chapman, 2004). To talk of arrested succession is to refuse to accept that nature is just disorderly, chaotic, and unpredictable.

Now not everyone agrees with the idea of stability in nature. Gleason (1917) raised some doubts to the idea that one sere (a plant community at a given stage of succession) is replaced by another until a self-regulating climax community is achieved. He posits that random events determine the composition of communities and for that reason, a given plant community/association rarely returns to its original state after being disturbed beyond a certain point. Thus, a single climatic area can contain a variety of specific climax types. Rather than seeing a climax community as permanent and stable, Gleason (1917) argues a plant community is a function of unstable and variable environmental conditions. Changes to environmental conditions can occur randomly and in ways that we cannot predict, let alone control.

Gleason (1917) also observes that succession can take a long time (long beyond what humans have been able to observe and for lack of historical information) and because of that the probability that physical disturbance e.g. fire, flood will occur is high. He writes, "many associations occupy their ground so tenaciously that there is little or no observable evidence that they are ever replaced by association ordinarily considered to be the climax of that region" (478) and thus "…the use of the term climax is accordingly largely a matter of convenience, and it will be applied broadly or narrowly, depending on the viewpoint of the ecologist" (479). Following Gleasons' train of thought, Holling (1973) points to the limitations of self-contained systems that oscillate around equilibrium/steady-state and argue that systems can be influenced by processes external to them. In this view, "the effective and responsible effort to produce a maximum sustained yield (equilibrium centred view) might paradoxically increase the chance for extinctions". Further, Wiens (1977) rejects the idea of carrying capacity – stable coexistence in which co-existing species compete for a limited (fixed) variety and abundance of resources. Instead, Wiens (1977) advance the view of variable environments as more responsible for community composition.

While the Clementsonian type of plant succession culminating in one climax (monoclimax theory) determined mostly by climatic factors, there also exists polyclimax theory of succession. The latter recognize the presence of many factors e.g. fire, grazing and soil nutrients that can produce more than one climax community in a region with similar climate. Thus, we talk of *pyral climax* (fire), *edaphic climax* (soil) and *biotic climax* (animal influence) (Kimmins, 2004:470, emphasis in original). A young forest can be comprised of climax tree species but it can be classified as secondary succession stage. An old-growth forest can be comprised of non-climax tree species but it can be classified as climax community especially if no change in species composition has been detected for a while. Succession is diffult to tell because it can take a short time and therefore be observable. It can also take longer than we can feasibly observe. So, "is there such a thing as a climax forests?" (Kimmins, 2004). It depends on who you ask. Succession entails changes in the structure and composition of plant community. Generally, it seems there is a consensus that change is an important characteristic of ecosystems. The disagreement is on the predictability of the change. Are the mechanisms and pathways of succession knowable (ontology)? How can we know (models) the mechanisms and pathways of succession (epistemology)? Are the changes deterministic or stochastic?

The jury is still out but ecologists embracing what is now known as new ecology are increasing (Schmitz, 2016). Ecologists are now incorporating non-equilibrium thinking in their work e.g. (Deangelis & Waterhouse, 1987; Wu & Loucks, 1995). The non-equilibrium ecology paradigm emphasizes heterogeneity as opposed to homogeneity, stochasticity as opposed to determinism, instability as opposed to stability, disorder as opposed to order, and the very fact that "equilibrium conditions are rare in nature" (Wu & Loucks, 1995:439). Likewise, forestry is moving away from equilibrium, crop-centered approach towards non-equilibrium, ecosystem approach (Kimmins, 2004; Perry, 1998). Ecosystem forestry recognizes that humans and human-induced disturbances are part of the ecosystem and that people will always depend on these ecosystems – any attempt to separate the two is superficial. This represent an important difference to the equillibrium thinking that gives "privilege to forestry sustainability and to one particular perception of ideal landscape at the expense of livelihood security and poverty alleviation" (Benjaminsen, Rohde, Sjaastad, Wisborg, & Lebert, 2006, p. 535).

Despite the compelling argument from non-equilibrium ecologists that external factors such as climate as opposed to density-dependent factors are probably more responsible for determining species composition and vegetation cover, equilibrium thinking such as carrying capacity and maximum yield has dominated wildlife and forest policies in Tanzania and other parts of Africa

since colonial times. Such has been the case despite observations that dry rangelands in Africa exhibit non-equilibrium dynamics (Benjaminsen et al., 2006; Scoones, 1995). The implication of the new ecological thinking is nontrivial. Since ecosystems are not in equilibrium, external factors such as drought (as opposed to grazing) are more influential of the ecological dynamics including the number of livestock and vegetation cover.

The inventory-based forest management plans are predicated on stability in nature assumptions – climax or rather self-regulating system is assumed. Rotation forestry which involves dividing the forest into management blocks assumes stability and order in nature. The influence of factors such as soil, rainfall, and fire are relegated in favour of disturbances arising from human activities such as grazing and woodcutting. Calculated harvesting levels (allowable cut) included in forest management plans are based on the view (tacit) that harvesting certain volume of timber will not change species composition in any unnatural way and thus that will not stand on the way of ecological system regulating itself. In other words, forest management plans are based on carrying capacity assumptions in the sense of imagining the level of disturbance a system can tolerate before being forced out of its natural succession pathways. As we learn from non-equilibrium ecology, these are all too strong assumptions to justify exclusion of local communities from their landscapes to give way for prescribed form of management that privilege wealthy timber traders (Benjaminsen *et al*., 2006).

The concern here is that policies based on contested scientific theories like "balance in nature" may not only fail to produce intended results but risks introducing unnecessary restrictions and disruptions to local livelihood strategies. This raises some ethical questions, which have attracted considerable interests in the study of environmental ethics. The questions as posed by Forsyth (2003, p. 16) remain: (1) "How supposed "laws" of environmental degradation (environmental orthodoxies) have been constructed without sufficient understanding of factors influencing ecosystems or of how social norms may influence such laws? (2) How such apparent criticisms of existing explanations have not been adopted by many governments, environmental agencies, or academic disciplines?" (p. 16).

4.2.2 Ecological Constraints: Inadequate knowledge of growth and regeneration at species level, and Uneven distribution of trees

Scientific forestry requires knowledge of growth rate and regeneration at species level. Rotation forestry employed in the management plans for miombo woodlands in VLFRs and calculations of allowable cut assume rate of growth for species in question in order to make projections on stand parameters such as basal area or volume per hectare. Knowledge of growth rates at species level

add confidence in the estimated harvesting levels as it enables one to make concrete statements about what the forest would look like if we remove certain number of trees today. Further, knowledge of regeneration is crucial as it enables a forest manager to make concrete statements on the eventual species composition following harvesting at a certain level. The task of a conventional forester is to ensure permanence in desired species composition, among other things. Inadequate knowledge of growth rate and regeneration make any claim that calculative forestry ensures sustainability flies out of the window.

For miombo woodlands, the prime target of CBFM initiative, knowledge of growth and regeneration at species level is wanting. While the literature on miombo woodlands is burgeoning, the knowledge of these biomes is still feeble. Most of the work on miombo focus on biomass and volume modelling, some on fire ecology, some short-term studies on recovery following disturbances such as logging and shifting cultivation and almost none on ecological interactions, interdependence, and functions. A major study, *Miombo in Transition*, reported limited information on growth rates for miombo species and most of it based on studies conducted in Zambia and little bit in Zimbabwe (Campbell, 1996). For the case of Tanzania, Mwakalukwa (2014) shows that modelling for sustainable utilization and management of miombo woodlands is hampered by scarce or missing information on growth at species level. The limited existing information is too variable to create any level of confidence. Questioning the growth rates for miombo species obtained using permanent sample plots, he writes:

> Malimbwi et al., (1994) estimated a Mean Annual Increment (MAI) of 7.4 m /ha/year for Kitulanghalo forest reserve in Morogoro, eastern Tanzania, while in the same area, Malimbwi et al., (2005) estimated MAI of 2.4 m /ha/year for the three-year period 1996-1999. For the same forest, Zahabu, (2008) reported three quite different values of MAI measured for three consecutive years between 2005 and 2008, namely 7.7, 11.8 and 2.56 m /ha/year. After crosschecking with measurements made the following year, the extreme value of 11.8 m /ha/year was suspected to be due to measurement errors. Alternatively, the large variation between years may partly reflect fluctuations in annual rainfall (Mwakalukwa, 2014).

Mwakalukwa (2014) uses growth ring measurement to estimate a growth rate of 1.93 ± 0.14 mm year^{-1} (mean $\pm$ SE) for *Brachystegia spiciformis*, a common miombo species. This compares to the growth rate of 3 mm year^{-1} commonly used in the management plan for village land forest reserves. The 3 mm year^{-1} is based on a study conducted in Kilombero valley that estimated an annual growth rate of 3.2 mm year^{-1} with a range 1 mm year^{-1} and 4.5 mm year^{-1} (FORCONSULT, 2015; UNIQUE, 2015). Nonetheless, the information on growth rate for each miombo species that take into account micro-climate and other factors is lacking. This undermines the scientific forestry model for the management of miombo woodlands significantly.

The *Miombo in Transition* study is unequivocal on the ability of miombo species to regenerate by including definitive statements such as "miombo species regenerate largely through coppice regrowth and root suckers rather than through seeds" (Chidumayo & Frost, 1996, p. 66) and "miombo species show a remarkable capacity to sustain regrowth, even when regrowth is regularly cut back" (Chidumayo & Frost, 1996, p. 67). But the fact that miombo trees regenerate following clearing (including selective harvesting) back to its original composition is still highly debatable (Field notes #96). A study conducted in the miombo woodlands of eastern Tanzania found more natural regeneration (coppicing) in public lands (more disturbed) than in a forest reserve (Luoga, Witkowski, & Balkwill, 2004). In his study of shifting cultivation fallows in Kilosa district in central Tanzania, Kilawe (2016) shows that miombo trees failed to regenerate and were replaced by different species. This challenges a conventional wisdom that if left undisturbed, miombo woodland is almost certain to grow back. The undisturbed area might regain vegetation cover again but not necessarily of miombo tree species. Despite the uncertainty, foresters have been acting as if regeneration is guaranteed especially if you heed to their prescriptions.

Since miombo woodlands are not planted, trees are unevenly distributed. Trees of different species and sizes are randomly distributed in a stand of forest. This makes miombo woodlands not amenable to the rotation forestry involving dividing the forests into management blocks. Trees of preferred species and size could be concentrated only on a one corner of the forest. Foresters have devised the minimum diameter for harvesting approach to address this problem. This way, forest manager can search in the entire forest for trees meeting the minimum diameter for harvesting. This approach is based on the assumption that diameter is directly proportional to age of the tree. But this pose a challenge as tree growth is a function of micro-characteristics including soil fertility and moisture. It is thus possible for a tree with a diameter above the minimum diameter for harvesting to have a higher proportion of sapwood than heartwood. It is also possible for a tree with a diameter below the minimum diameter for harvesting to be mature with higher proportion of heartwood than sapwood. Leaving this tree standing assuming that it would grow in diameter over time risks losing the tree to heart rot and other attacks by pests.

4.2.3 Social, Financial and Human Resources Constraints

Klooster (2002, p. 44) argues that scientific forestry approaches often fail on the task of managing resources that local communities are dependent on and whose involvement in managing the resources is necessary for they are based on "faulty models, limited and socially inappropriate goals, and incomplete information on basic parameters". Further, scientific approaches "often fail to create the local social institutions needed to encourage environmentally appropriate social

behaviour" (Klooster, 2002, p. 44). By definition, scientific claims erase the space for deliberation needed to develop a socially just and acceptable forest management approaches. When a professional forester makes a claim that scientifically it is incorrect to harvest tree of a diameter less than 45 cm, he or she is technically telling local communities that you cannot debate this matter because science is very clear about it and since local communities do not possess scientific knowledge to match that of a professional forester, the chance is they will not counter even though they may have some reservations. When a professional forester makes a scientific claim that local communities cannot graze their livestock on a certain piece of forest because the ecosystem is delicate, and the forest is an important source of water or harbour some endemic species, he or she is closing the debate and the task becomes to educate rather than deliberate with communities and opportunities to mash-up scientific forestry of professional foresters and traditional resource-management systems of local people, as Klooster (2002) recommends, are wasted.

Since scientific forestry has the tendency to undermine local uses of forestry, it is unlikely that forest management approaches emanating from it would garner widespread support by everyone in the communities. So, compliance to the prescriptions contained in technical forest management plans is not necessarily voluntary grounded on consensus. As a result, this necessitate the use of militarized of village forest guards akin to the rangers used to protect government forest and wildlife reserves. The idea that local communities would be incentivised to protect the forests if they are meaningfully involved and derive benefits from the forests is thus undermined.

Application of scientific forestry approaches is also challenged by financial and human resources constraints. The financial and human resources required to measure all 19.6 million hectares on forests on reserved land, 21.9 million hectares of forests on village land, and 2.7 million hectares of forests on general land are likely to be massive. At the moment, human capacity for conducting inventories and the related analyses is inadequate. Most professional foresters cannot do so. Private forestry firms that can provide forestry mensuration services are non-existent in Tanzania. Most of the forest inventories are implemented by forestry academics from SUA, who are no more than five specializing in forest mensuration. Even if financial resources were available, it is unlikely that the few forestry academics would realistically be able to cover all forests on top of their teaching and research commitments. The national efforts to inventory forests countrywide (NAFORMA) that was completed in 2015 only employed sampling design sufficient to generate national level picture of the forest resources in Tanzania. The data generated in this multi-million efforts is thus not suitable for informing site-specific management decisions including estimation of harvesting levels. Heeding to the ideals of scientific forestry would require detailed inventory and management planning of each piece of forest in the country, while achievable, it is unlikely to

be economically feasible given other development priorities the country has.

In the context of CBFM, the challenge is even more immense. Local communities cannot complete planning processes on their own. They need to call in experts, who can be expensive. To be declared a VLFR, a village must be registered. To ground VLFR on the right legal footing and to pre-empt land use conflicts, today this is generally accepted to mean village land use planning is indispensable. The absence of village land use plans has been blamed for farmer-herder clashes, even though land conflicts are more complex and political than protagonists of the technical might suggest (Walwa, 2017). Village land use planning is an expensive exercise. Despite the government ambition to survey, measure and draw up land use plans for all villages, only 1640 villages have land use plans in Tanzania out of a total of 12,000 (Kami, 2017). Most of these were only complete where external financial support was available and often because land use plan is a requirement for accessing resources e.g. wildlife, forests, land found in these villages. Forest inventory and management planning are also expensive.

Social, financial, and human resources constraints are evident and threaten to compromise scientific forestry approaches. Professional foresters and scientists might want to argue that science must come first before concerns about resources needed to implement scientific approaches. That one cannot say scientific forestry approaches are bad simply because they are expensive, especially it there is no alternative to sustainable forest management. While we should be sympathetic to these views, the concern about financial and human resources constraints is not to question whether the science is good or bad. It is more of a question about relevance. What is the point of emphasizing on scientific approaches while there is clear indication that it would be unlikely to implement them?

4.3 Conclusion

The chapter sought to set the stage for the discussion that follow in the empirical chapters of the thesis. It specifically sought to define scientific forestry, scientific knowledge, and some key challenges to the scientific forestry approaches. Earlier attempts by Germans to concur mangroves and miombo woodlands with scientific forestry did not produce intended results (Schabel, 1990). The British who came after them did not succeed either (Sunseri, 2009). In post-colonial era, Tanzanian foresters have been trying to get the colonial project off the ground with little success other than expanding the network of reserved land. Today, more Tanzanians have received training as professional foresters than under the German and British colonial administrations. But throughout the history of scientific forestry in Tanzania, there has never been sufficient professional foresters qualified to implement scientific forestry ideals. Financial

constraints have also meant that less than ideal form of scientific forestry was implemented especially to the management of natural forests and woodlands.

Scientific forestry has also been met with other realities. The ecology of miombo woodlands does not fit neatly to the ideals of scientific forestry and the woodlands is not amenable to silvicultural manipulation beyond restrictions and control of local uses. For this reason, coupled with the practice to present scientific claims as being beyond question, scientific forestry approaches fall short in creating solid local institutions needed to achieve sustainable forest management.

Scientific forestry emphasizes measurements and calculations of sustainable harvesting levels. Done this way and ignoring local uses of forests, scientific forestry reduces sustainability to a single number. To think that local communities can somehow stop touching trees and forests against their interests is to simplify. Though couched in technical language, scientific forestry turns out to be a project of simplification and wreaking havoc on rural livelihoods – reducing everything to numbers and discarding complexities for they complicate models. Because everything starts with a thought, this thesis aims at showing that problems start with the view of forestry that shun complexity. The thesis is an attempt to argue that ecologically sustainable and socially just forestry is about embracing complexity, and that forest management is dependent on ecological, economic, social, and political systems. It is not simply about measurement and calculations. It is about contextualization and adopting to local conditions, not one size fits all kind of approaches. It is about incorporating many views and understandings and not just the single view.

The aim is not to argue that scientific forestry approaches are bad. It is also not the aim of this thesis to argue for local forestry knowledge. This thesis is preoccupied with the puzzle that despite all these challenges to scientific forestry approaches, these approaches are still privileged as the solution to sustainability question. The community-based forest management intended to increase local communities' participation in forest has also come to be imbued with scientific forestry ideas, even when evidences to show such a framing can produce the intended outcomes are scarce. The next chapters explore the puzzle and seek to understand foresters' emphasis on scientific forestry approaches even when they are not supported by realities and evidences. This is particularly crucial especially because it is not fully plausible to think that professional foresters' intention is to destroy forests and rural livelihoods in the name of sustainability.

Chapter 5: Forestry Education produces Scientific Forestry Habitus

> "Like in store keeping, inventory is an important exercise of cataloguing materials and goods held by an organization. A store keeper cannot preside over a store he or she is not aware of what is being kept inside. A forest manager is like a store keeper – he/she inventories the forest to know the value of what he/she is managing. Further, he/she undertakes other tasks of a store keeper, including arranging the forests, preservation, recording, and issuing of the materials"
> - An undergraduate forestry student at SUA

5.1 Introduction

This chapter examines whether forestry is taught in a way that upholds, not question, the dominant views in the forest management field. Further, it seeks to understand whether forestry training proceeds in such a way to naturalize oppressive practices. If forestry education creates habitus that naturalizes technical practices, that would go a long way towards explaining the naturalized oppressive practices common in the forest management field. Examining forestry training is the first step of understanding symbolic domination in the forest management field; of finding out where does forest management practices come from and how they are maintained.

The chapter thus focuses on the contents of forestry education and pedagogy. Do contents and pedagogy allow for multiple conceptions or just *the view* in and about forestry? Does forestry education allow for questioning dominant views in forestry? The absence of questioning is a strong indication of conformist educative action. The chapter begins by presenting student characteristics. This description helps to enhance understanding of the results and the discussion that will follow. The chapter then turns to discussion about the structure of forestry education and contents of these programs.

5.2 Students' characteristics: Amenable to developing scientific forestry habitus

5.2.1 Forestry is not the first choice for many students

Forestry undergraduate program does not seem to be the first choice amongst prospective students. In the forestry class of 2016, only 28 out of 59 students surveyed stated that forestry was their first choice (Table 2). Further, of the 28 students, 16 received training in forestry before joining SUA. This leaves only 12 direct-entry students who reported forestry degree program as their first choice. This result is not unique to forestry degree program, however. Only 21 out of 58 horticulture students class of 2016 reported that the degree program was their first choice (Table 2).

Interviews and conversational interactions with students confirmed the survey data. Some students even stated that they only heard about forestry degree program when they encountered the complications of applying for admission. The degree program is rarely a childhood dream for many like becoming pilots, medical doctors, and lawyers. A fellow PhD student, a forester, confessed that he learned about forestry degree program when he visited SUA to collect and complete application forms. He arrived at SUA determined to apply for home economics degree program. When he revealed his plan to the officer issuing application forms who happened to be affiliated with the then Faculty of Forestry, the officer objected arguing that Home Economics degree program is meant for women. The officer introduced him to the forestry program instead. Interviews and conversational interactions indicate that direct-entry students pursuing forestry degrees would prefer to study and pursue a career in something else. Leaders of the then Faculty of Forestry confirmed that forestry and SUA in general is not popular amongst high school students (Interview #34). Some of these leaders, who are professors of forestry, confessed that they also preferred to pursue medical degree, only to be persuaded to studying forestry after failing to secure admission to a medical school.

Table 2: Students' Choice of Degree Program

	Forestry Class of 2016	Horticulture Class of 2016
Forestry/Horticulture Training Before SUA	16	18
Forestry/Horticulture First Choice	28	21
Class Size	59	58

Source: Own survey data (2015)

The story of accidentally ending up studying forestry is surprisingly common among students. Centralized admission and students loan systems in Tanzania were mostly blamed. Direct entry forestry students majored either in physics, chemistry, and biology (PCB combination) or chemistry, biology, and geography (CBG combination) in high school. Joining a medical school is a target for most of these students. But admission to medical schools is very competitive for various reasons. Medical students receive 100% scholarship. In addition, society attaches a lot of prestige to medical doctor/profession and often parents would prefer their children to pursue medical degrees. Or else in one of the mainstream professions – accounting, doctors, law, and

engineering. Further, because available spots in medical schools are fewer than the number of applicants, only applicants with the highest grades make it.

Those who miss out on medical schools are thus left to look for other choices. The second preferred choices are usually those that attract the most generous scholarships and often these are related to medical degrees e.g. Bachelor of Veterinary Medicine offered at SUA. Students who miss out on their second preferred choices are thus forced to compete for dwindling options of degrees that attract government loans. Not all degree programs attract government loan and thus students must tread carefully lest they risk ending up with degree programs that are 100% paid from private sources. Forestry is among the degrees that attract government loan. Because higher grades translate to best students in Tanzania, which is not necessarily the case given how science is taught in secondary schools, it follows that forestry does not attract the most brilliant students out there. This has led academics at SUA to suggest that the centralized admission system is biased against SUA in general (Group discussion #32). Academics suspect that best students are never sent to study degree programs offered at SUA. And that the situation is poised to worsen, as the government is reducing budget support and tightening the eligibility criteria for loans provided to students including those pursuing degrees in some science disciplines offered by SUA. The fear is few prospective students would choose to pursue degree programs available at SUA if they are required to pay entirely from private sources with no government support of some sort.

The Government of Tanzania has since changed the admission system to more decentralized procedures. Beginning the 2017/2018 admission cycle, "the prospective applicants to lodge their applications to institutions of their preference".[17] It is however unlikely that the new admission system will re-order prospective students' preferences for degree programs.

Equivalent entry students are more settled with the fact that they are pursuing a degree in forestry. For them, joining SUA is not about choosing a career because they have already been working as foresters. Generally, they are more committed to following up the training than direct entry students. But even among equivalent entry students, some did not choose to enter forestry profession. Stories of many students shows that the prospect of receiving loan to cover for the cost of higher education decided the fate of many students. A female equivalent entry student narrated a story which shows that she ended up studying forestry after she refused to pursue a degree in education because she hates teaching (Field notes #16-25).

Interview and conversational interactions indicate that some of the forestry students, mostly female, are not keen to pursue a career in forestry even after undergoing training in the field. They

intend to switch to other professions such as nursing, medicine, and business, as this quote illustrates:

> "Forestry was never my choice. My dream is to work as a health professional. I always wanted to join medical school. When I missed out because of my low grades, my parents said I should just study forestry because you will never know what the future hold for you. I honestly didn't want to, but they insisted. My plan after SUA is to pursue a Master of Public Health or if possible, join a medical school and pursue a degree in medicine. I will need your advice on how to apply for scholarships because I am sure this is something you have done several times" (Interview #71).

Since some students join forestry programs by chance, one would be forgiven to think that it might be harder for these students to develop scientific habitus. But in the context described in the previous paragraphs, a forestry student at SUA is not someone prepared to question and understand forestry. He or she is someone studying forestry because he or she was expected to pursue a university degree after advanced level secondary education. Studying forestry is not considered an end in itself but a stepping stone to something else. Therefore, these students invest in passing examinations and get out of university to pursue their careers of interest, if possible. In such a situation, scientific facts in forestry are studied as set of ideas reflecting realities (as in absolute truths) and thus they cannot be questioned or scrutinized. The argument here is that without understanding forestry science, students have no basis to scrutinize and question its underlying assumptions. This create an ideal condition for acquiring scientific forestry dispositions – the particular framework for thinking and applying forestry.

5.2.2 The mix of direct and equivalent students: a feature that contribute in producing habitus

The other important feature that enables students to develop scientific forestry habitus is a mix of direct and equivalent entry students. Equivalent entry students have prior training in forestry and working experience as foresters. They thus serve as reference for reality check to direct entry students about the forestry profession. Direct entry students have more access to their peers through everyday conservational interactions, group assignments, preparing for examinations, field practical training, and other students' activities. As peers, equivalent entry students offer a more candid assessment of career in forestry through anecdotes and lived experiences on issues ranging from the best work station, sub-discipline of forestry attracting higher income and thus advisable to specialize in, to the likelihood of making it in life by pursuing a career in forestry. I observed incidences of equivalent entry students providing assurance to their peers who appeared sceptical about the forestry degree and career in forestry (Field notes #7 - #15). Equivalent entry students have the effect of making direct entry students imagine work life – how to get assigned to the best work stations, how to get promotion, strategies to boost incomes etc.

An average forestry class at SUA is a mix of direct and equivalent entry students. The 2015 class had almost equal number of direct and indirect entry students. The composition is changing for 2016, 2017, and 2018 with the number of equivalent entry students on the decline (Table 3).

Table 3: SUA Forestry students' entry qualifications and work experiences

			Forestry Training Before	Work Experience in Forestry
Class of	2015	Yes	28	28
		No	46	46
		Class Size	74	74
	2016	Yes	13	11
		No	58	60
		Class Size	71	71
	2017	Yes	15	15
		No	100	100
		Class Size	115	115
	2018	Yes	13	7
		No	57	63
		Class Size	70	70

Source: SUA Admission Data.

For the observed students at SUA, equivalent entry students appeared more resolved into believing ideas in forestry science. They were much clearer about the motivation for pursuing a degree in forestry and expectations. From interviews and conversational interactions, equivalent entry students are simply looking to further their career more than learn new knowledge and skills. For them, FTI (where they previously trained as foresters) is better at imparting hands on skills in forestry. When I asked a group of equivalent entry students in one of the usual gatherings before the lectures whether they are pursuing a bachelor's degree in forestry because they want to become bosses, one of them replied with unanimous approval of others:

> "That is not a straightforward thing (to get appointed to a higher position). Yes, when we go back with a degree, we will be re-categorized into officer's title track. For some of us with a good number of years at work, the entry-level salary for someone with a degree is lower than what we are getting now. So, we will be re-categorized but keep our current salary levels. No change in salary levels. Also, degree does not guarantee higher position. You can still work under someone with lower level of education. If you are well connected within TFS (forestry service), you stand a better chance. Otherwise, you can still be sent to the most remote, difficult stations with your degree" (Participant observation, #60).

This quote differentiates between a title and a position. Title e.g. principal forest officer is statutory and determines salary scale. A position e.g. a manager of a forest reserve is assigned as per the

discretion of the Chief of the forest service and his/her senior management team. Position does not determine salary scale but comes with power to make decisions. While experience might prevail over academic qualifications in assigning people to positions, the ongoing restructuring means certain positions are more likely to require minimum level of academic qualifications.

At SUA, equivalent entry students report that they expect to learn more about theories than hands on skills in forestry. Nevertheless, a certificate of bachelor's degree is an important tool for power struggles in the forest management field. Bachelor's degree commands more power, trust, and prestige than a diploma in forestry obtained from FTI. With a bachelor's degree, you are a professional forester, not just a technician. When I asked a recent graduate, who attended FTI before obtaining a forestry degree from SUA and is now working for TFS, whether she decided to get the degree because she could not handle some tasks for lack of knowledge and skills, she said:

> "With a certificate from OlMotonyi, I was not that competent in planning, inventory, models, formulas, budgeting. [After SUA], I feel a little bit more competent. [But] it is not only about being competent; it is more about being trusted to do some important tasks. With only a certificate, you cannot be trusted even when the quality of your work match that of people with bachelor's degree and even master's degree. At the HQ [*headquarters*], almost everyone is a degree holder or higher. To be stationed here and be trusted to do the kind of tasks undertaken here, a bachelor's degree is necessary. After SUA, I cannot say I was 100% competent. Training at SUA is less practical than at OlMotonyi. I did not gain anything more in terms of practical skills than what I learned at OlMotonyi (Interview #71)".

The quote further illustrates that for equivalent entry students, joining SUA is part of their struggle for authority. The quote also illustrates that students leave SUA uncertain about their confidence to do forestry and work the forests. This is not only because of the recognition that forestry education at SUA is less practical, but also because rote learning is pervasive. Employers are complaining about the ability of graduates to do the work. An employer managing plantation of fast-growing exotic species in the Southern Highlands stated his frustration that they had to incur cost to send new hires (SUA forestry graduates) to FTI for a hand on practical training on plantation management (nursery, planting, tending a stand, fire etc.) (Interview #79).

As mentioned before, direct entry students at SUA have vague ideas about what lies ahead. They do not have a clear idea of what it entails to study forestry and later work as a professional forester. Direct entry students often ask questions like: what am I going to do after my bachelor? Is forestry really a career that would see me owning cars, houses, and sending my children to nice schools? How is it done in practice? Between forest mensuration and forest biology, which one pays more? Here is where equivalent entry students with work experience play a pivotal role of giving assurance and getting sceptical students to commit into the forestry profession. Through their interactions, they assure their direct entry classmates that forestry is a profession like any other and that one can be employed, travel abroad, have an income, and live a decent life.

The other way in which the equivalent entry students help to create conditions for the acquisition of scientific forestry habitus is during field practical training. Usually, students will be divided into groups for field practical training and based on my observation work in each group is usually led by equivalent entry students with work experience. In this way, they help to translate class lecturers into actions, something that direct entry usually struggle to carry out on their own. In the process, equivalent entry students play a crucial role in proselytizing direct entry students on the value of scientific forestry. In field practical training, equivalent entry students tell anecdotes about challenges encountered in the field e.g. how challenging the NAFORMA (countrywide forest inventory) process was. The anecdotes also include who are the most influential and respected forestry academics in the field. For students who did not choose to study forestry, some have developed interest in forestry after undergoing training and interactions with academics and equivalent entry students.

The next sections examine whether forestry education as organized as well as its contents is capable to producing scientific forestry habitus.

5.3 Organization of the forestry training: The Educative Action Designed to create scientific forestry habitus

This section considers whether the way forestry training at SUA is organized create "unified subjective structure" for the forest management field in Tanzania (Lave, 2012b). Is forestry education structured to elevate certain values while suppressing competing ideas and conceptions? To answer this question, this section examines the organization/structure of forestry education. Specifically, the section examines the flow of materials, pedagogy, and diversity of ideas. According to Lave (2012b), the targeted materials is a sign of specific form of educative action and the overwhelming flow of materials means students have no time for reflections and questioning of these materials.

5.3.1 Materials: Targeted and Overwhelming Flow

At SUA, students must take courses amounting to 12 credits per semester or more (SUA, 2008). Twelve credit hours translate to at least four courses of three credits each. A three credit Forest Management Planning course translate to 150 contact hours per semester, which usually take no more than 90 days. Contact hours include lecturers, seminars, and practical sessions. These 90 days include two weeks break in between, several progress tests (examinations), a study break in preparation for end of the semester examinations, and up to three weeks of university examinations.

Students usually complain that a semester goes fast. This is not necessarily because of the short time allocated for it. According to students, it is not unusual for lecturers to start teaching well into the semester for example. Even though some lecturers do show up on the first day of the semester, they too will inevitably accumulate several no-shows over the course of the semester (Interview #73). Some lecturers leave it to the last week or two before university examinations and cram a series of long lectures into a space of a few days (Interview #45). This approach amounts to teaching to cover syllabuses and allow students to write examinations.

Examinations is another key factor that makes a semester last fast. Students are usually preoccupied with passing examinations to avoid failure and discontinuation from studies. Once dates for examinations are announced, the focus shifts to examinations. For a SUA undergraduate student, exam dates approach fast. When focusing on passing examinations, the interest is not learning and reflection on the materials. Further, the way examinations (the main means of assessment) are composed reinforces cramming rather than learning for understanding. Drawing on my own experience, I once wrote a botany exam at SUA in which all the questions asked about family names of not less than 60 different plant species (class of 2004). For one to pass such an exam, it is important to resort to cramming because the chance is you have not seen these species. A finalist at SUA worried about the approaching university examinations (end of the semester 5 examinations in February 2017) described the situation to me during a study break (a week set aside to prepare for examinations). I asked him why he is worried about examinations while most of what is taught in the last semesters of undergraduate forestry program (third year) are things he should be familiar with from work? He replied:

> Respondent: "Not only third year, even second year. But you know, examinations are just like that. This is why there is such a thing as exam fever. If they tested general knowledge, I can apply my knowledge from work – from my own experience and from seeing how foresters do these things out there. But that is not the case. You must revise notes to the last minute. Also, instructors did not come to the class on time. Most of them just got serious about teaching in January 2017.
> Interviewer: *What do you mean?*
> R: FMM (forest management plan) is taught by six lecturers. Honestly, all of them started to teach seriously and asking for extra time in January while the semester started in November. The problem is we had to write tests (examinations) before teaching ends on 3 February. That put a lot of pressure on us. Even worse, there are a lot of other things going on, including special project presentations and other classes (Interview #73).

This quote illustrates common complaints among students – so much to study and write examinations on in a very short time. In a semester system, students are expected to consume large amount of contents in a short time. Students admit having resorted to cramming materials just to pass examinations. This means that the set up does not allow for deep reflection and understanding

of the contents, which is thus deferred in favour of passing examinations. During my time in high school and undergraduate at SUA, we had a Kiswahili word for it: *bandua*, literally meaning *mechanically peel off (the paper)*. *Bandua* was used to refer to a situation where you have neither time nor desire to reflect and understand materials and thus lift them verbatim off the paper on which they are printed and worry about understanding later. I asked a student, what should be done then if the current set up discourage learning for understanding;

> R: "I think if we were only required to take classes from one department only, it would improve our learning. Now, we take a diversified set of classes from engineering, tourism, economics, wood utilization, biology, communication skills…it's just a lot. If we were only taking classes from FMM – biometry, survey, resource assessment, management planning – then you can master something. But now we are taught a lot of things but my knowledge of each of these things is shallow. The teaching is shallow because there is not enough time to dig into anything. For now, we just memorize things to pass examinations; we will understand the materials later (under no pressure for examinations). The field practical training is inadequate. Only few weeks for so many things – surveys, agroforestry, resource assessment – you name it. Learning for understanding is deferred until some other times.
> I: *When?*
> R: When I get back to work. I have friends who have finished school already calling to ask for silviculture compendium. They are still using these materials" (Interview #73)

To some extent, field practical training covers up for these shortcomings. As one student said during the management planning fieldwork in Kitulanghalo Forest Reserve, "*when they were talking about concentric plots in the class, I couldn't visualize what kind of plots they were these. I was only able to understand after we did it here in the field*" (Field notes #38). But inadequate funding means field practical trainings are suffering – length and intensity are continuously being reduced.

Rote learning and meagre practical training suggest that the layer of scientific forestry dispositions deposited on students is only superficial and can easily be replaced. This does not seem to be the case, however. If anything, it means that students do not develop understanding of the contents to criticize it. They acquire scientific forestry values uncritically. This means that the absence of meaningful learning limits students to a particular representation of problems and therefore to particular set of solutions irrespective of changing contexts. We also see that the costs of not believing in what is taught in class are potentially high. Passing examinations is crucial to ensure graduation and become a professional forester. If you doubt what the teachers are teaching, you are likely to fail examinations and the outcome is discontinuation from studies. As Bourdieu (1975) observed, *strategies for subversion* are costly. In the end, learning becomes;

> "The game is to please lecturers – answer examinations and get your certificate. You will learn to understand later in the journey. You went through the same system. Are you saying you don't know these things?" (Interview #73).

The bachelor degree program in forestry at SUA has the feel and features of short courses described by Lave (2012b). There is an element of compressing quite a lot of materials in semester, as reported by students. Unlike Lave (2012b) short courses, the university Bachelor Degree in Forestry at SUA covers large amount of materials. But the range of information presented is narrow, which means materials are precisely targeted for relevance to particular type of forest management. The curriculum focuses on the core subjects to forestry discipline. It mainly covers forest ecology, biology, utilization, forest management and mensuration, and forest economics (SUA, 2008). There is none or little e.g. development studies in the curriculum in terms of subjects that draw from a body of ideas other than those core to forestry discipline. The targeted and overwhelming flow of materials leave no space for reflection and understanding of the materials. Students often report that they come out of the courses without much understanding of the materials. More details on the content of forestry training are provided in sub-section 5.4 below.

5.3.2 Pedagogy of Consumption: Teaching to the Test

As we see in the previous section, forestry education at SUA covers theoretical aspects in a relatively more detail but not in a way that encourages questioning the theories and underlying assumptions. Theories are taught as rules - as scientific laws that are not to be questioned. Teaching is less than discussion-based learning – a pedagogy grounded on dialogue and discovery (Freire, 2000). Materials are passed on to students without much scrutiny. Students are keen to memorize what their teachers are telling them. Based on observations, interviews, conversational interactions, and my own experience as an undergraduate student at SUA, the questions “why” and “how” are rarely brought up in SUA classrooms, neither by teachers nor students. As forestry academics in a leadership position at the then Faculty of Forestry and Nature Conservation put it, “it is quite normal for a semester-long course to end without any student asking any question” (Interview #34).

As an example, I observed SUA forestry students during the forest resource assessment field practical training at OlMotonyi in August 2015 (Field notes, #16 – #25). In my group, students used calliper for measuring tree diameter. They held the calliper perpendicular to the stem with the jaws on either side of the stem. The equivalent entry students kept on insisting that the graduated measuring scale part of the calliper over which one part of the jaws slide over should point to the centre of the plot. The direct entry students in the group did ask why. The answer was not convincing other than saying this is how it is done out in the field. Students were not willing to pose that question to the teacher either, even after I insisted they should. The answer I was expecting was as follows: because trees often have irregular, non-circular stems, one can obtain

different diameter readings depending on where you put the calliper. Generally, students were keener to imitate printed procedures shared by the lecturer on how to go about carrying out forest resources assessment than to scrutinize and question whether these procedures make sense and why. The lecturer, on the other hand, was more interested on checking whether students adhered to the procedures and did all the calculations as instructed.

Students take whatever lecturers say as given and therefore it cannot be challenged. If something does not make sense or difficult to grasp, students usually assume that it is their fault because the lecturer is always knowledgeable. Students have reported that some of the lecturers are not friendly and approachable and when you engage with them, they can choose to humiliate you in front of classmates (Field notes #16 – #25). Other explanations exist, namely the inadequate communication skills and the tendency of lecturers not to entertain questions (Interview #35). The medium of instruction is English. While most students can understand the language, very few have the courage to speak out in class, let alone to challenge and debate with lecturers in English. It is quite common for students to poke fun at a classmate who produces broken English when making a point in a class. As one senior professor put it, "students have difficulties to communicate their ideas in English and thus questions they may have go unasked. Also teachers, who are a product of the same system, can be very defensive for reasons associated with difficulties in communicating in English*"* (Interview #35; also see Komba, Kafanabo, and Njabili (2012).

I observed lecturers trying to encourage students to ask questions. Lecturers are looking for clarifying questions from students. When few students ask questions, the manner in which lecturers address these questions can discourage further questioning and discussions in classrooms. It is also common for teachers to throw clarifying questions to students. Usually, these questions are intended to check if students paid attention during lectures and if they can reproduce the presented materials. The intention is not to help students scrutinize and critically engage with the materials. At the lectures I attended in August 2015, the lecturer tried to throw clarifying questions to students perhaps to spur discussions. Few students tried their best to respond, repeatedly proposing answers as the lecturer rejected them. In the end, students expected the lecturer to give his verdict, but he never did. Instead, the lecturer asked students to go and read their notes. One student even protested that the questions asked are not sufficiently addressed in the notes. The lecturer refused to bow. Students were left frustrated; some speculating that maybe the lecturer does not know the answers and thus the generic response "go and read your notes" is a defensive mechanism (Field notes #16 - #25). The lecturer later explained to me that everything was covered during lectures in previous semesters, but students are just not serious (an issue of the compartmentalization of knowledge by semesters).

In the end, students reported they are not keen to respond to questions posed by lecturers anymore or ask questions for fear of being put on the spotlight. If you engage a lecturer, he/she is likely to respond by throwing a series of questions back in a tone and manner meant to valorise his/her position rather than try and understand the point student is trying to bring up. And if a student fails to produce answers, his/her argument is buried. This does not necessarily mean that students' arguments are hollow. But it is more about lecturers' attempt to affirm the dominant views they approve of and students' inadequate courage and articulation to challenge what is presented to them as scientific laws. One student summed it up like this:

> You saw how he treated us. Because of the way these lecturers behave in the classrooms, the arrogance, students feel weaker, stupid, and unable to ask questions or bring up arguments in classrooms. We have now decided to keep quiet. These lecturers will say things like 'if you keep quiet, it's up to you'. 'That I don't care even if you learn nothing'. 'It's up to you. You are not my children' (Participant observation #16 – #25).

In sum, teaching style and relations between lecturers and students ensure that students are not critical of the forestry knowledge they are picking up. The relationship between lecturers and students is at times sycophantic – students show lecturers so much respect to the extent that challenging them amount to being disrespectful. The forestry pedagogy has all the features of pedagogy of the oppressed as defined by Freire (2000). Teaching proceeds such that what is being taught represents a set of solutions to the already defined problems. Teaching does not focus on developing skills and capacity of students to question existing ideas so that they are better positioned to formulate problems and make sense of their environments. This way, students consume as opposed to discover knowledge. In Freire (2000, p. 73) own words, "the teacher teaches and the students are taught", "the teacher know everything and the student know nothing", "the teacher talks and the students listen – meekly".

The interest here is not so much to criticize the lecturers for we are the product of the same education system and we have all come to see banking approach to education as natural. The interest here is to argue that this pedagogy enables the reproduction and perpetuation of the dominant views in forestry and disables its disruption (Bourdieu, 1975; Bourdieu & Passeron, 1990). In other words, for not emphasizing questioning and problem-posing pedagogy, forestry pedagogy is symbolic domination for it deposits on students only the scientific forestry view. Problem-posing education is contextual, not imposition of foreign ideas on students and society. The 'banking' pedagogy employed in forestry education enables students to develop scientific forestry habitus (Bourdieu, 1975).

While there are discussions about the suitability of the pedagogy and efforts are underway to transform the teaching methods towards discussion-based, it is unlikely that these changes will be deep enough to turn the pedagogy of oppression on its head. I did not come across anything to suggest that the new pedagogy will focus on problems formulation rather than teaching the existing knowledge as set of solutions. The focus is still very much on ensuring that students grasp rather than problematize and radically change the existing scientific knowledge and ways of knowing. It remains to be seen whether the implemented changes will amount to problem-posing and liberating pedagogy proposed by Freire (2000).

5.3.3 Absence of Contrasting Ideas

There is a notable absence of contrasting ideas in forestry education in Tanzania. For students of forestry at SUA and FTI, there is nothing like extra private tuition for forestry. Forestry students have no opportunities for meeting individuals (practitioners, other professors etc.) who might question the premises being taught and thus expose students to ideas and thoughts opposing those of their professors. Coupled with the absence of discussion-based and problem-posing teaching, this further means that ideas presented by forestry lecturers are accepted without undergoing serious scrutiny. As Lave (2012b, p. 85) observes, the absence of contrasting ideas endows the bachelor of forestry degree at SUA with the capacity to create "intellectual conversion" crucial for producing scientific forestry habitus.

Forestry teaching proceeds as if whatever is being taught is a complete knowledge. There is little or no emphasis on the limitations and/or criticisms of the knowledge deposited on students. For instance, forest resource assessment - of which forest inventory is a part and a prerequisite for forest management planning - is taught with no regards to the limitations and validity of the underlying assumptions. There is no regard as to the ideas from non-equilibrium ecology challenging the stability in nature assumptions underlying forest inventories and yield forecasting. The teaching of some generalized theories e.g. ecological succession theory tends to present these theories as silver bullets, with no weaknesses and are generally acceptable even when debates around these theories are raging.

A study of the Fundamentals of Ecology (FBL 102) compendium about succession in plant communities shows that equilibrium thinking is dominating. Succession in plant communities is presented as reflecting reality in nature and as a scientific law that is beyond question. The teaching notes ignore the competing ideas from non-equilibrium ecology – those that are based on the assumptions that natural ecosystems are always on flux and thus any claim of orderly and

directional succession is oversimplification (Langston, 1995). Consequently, students are made to believe or memorize that there is only one way of doing forestry which is limitless. Students leave classrooms with the impression that what is taught by their lecturers is a universal truth that cannot be questioned, at least by undergraduate students. Since rote learning is dominant, students rarely acquire a deeper understanding of these scientific laws. One student personified this during a field work in miombo woodlands near Morogoro (Kitulanghalo FR):

> S: Kitulangalo forest is a secondary succession. There are no big, mature trees. The management is doing a good job [of keeping people out] for the recovery of this forest because it seems the forest was heavily utilized and it's now recovering.
> *I: How did you know this secondary succession?*
> S: The forest is only dominated by small trees. No big trees.
> I: *You can have a climax community with small trees. No?*
> S: Mmmmh, well this is clearly a secondary succession.
> I: *What is a climax community?* (Participant observation #38)

I continue to probe about students' understanding of climax community. Other students' laugh and tease their friend to respond to a question because it is something they have learned in class. Clearly, students understand climax community in terms of mature trees rather than species composition (Participant observation #38).

Most students did not quite capture the mechanics and core of plant succession theory, meaning they didn't quite understand its implications and the role it plays in shaping forest management approaches. When I pressed a student to think of some of the problems of plant succession theory, he replied:

> I told you we just memorize to pass examinations. I do not remember anything about succession. Maybe if I revise a bit, I will be able to tell you what it is (Interview #73).

A lecturer objected by arguing that his approach to teaching is different – he does not teach scientific theories as laws and he emphasizes on the shortcomings and criticisms of the theories. He then went on to describe his approaches to teaching restoration ecology for which plant succession theory is the core. In restoring a degraded ecological system, we talk of a desired target – desired plant community (the end outcome) that would mean that the system has been restored almost to its original state. If we think of nature as being in constant flux, we are aware of our inability to restore a natural system to the desired plant community. Instead of ending up with a forest, one could end up with grassland through processes that cannot be correctly predicted beforehand.

We thus talk of deviations away from the pathways to the desired target that would allow us to declare a degraded ecosystem restored. The task of a restoration ecologist is to steer the ecological

system to minimize deviations as much as possible. And arrested restoration refers to a situation in which the ecological system is off from the order towards the desired target. It is important to observe that one is only able to talk of arrested restoration after invoking assumption that there is order in nature and this order is predictable. Otherwise, an ecosystem will experience arrested restoration to what? Restoration ecology, by definition, assumes that it is possible to engineer a degraded ecosystem to follow a certain order and eventually recover its original state (Lave, 2012b). This is equilibrium thinking par excellence.

I asked professors about the tendency to obscure disagreements or unanswered questions in their teachings. The common response was in the form of questions:

> "What is the alternative (to teaching the knowns)? For lack of alternative, what is the point of questioning the underlying assumptions and focusing on limitations to the existing knowledge? After all, curriculum instructs us to teach the known as opposed to unknowns" (Interview #36).

Lecturers agree that they only focus on the knowns in their teaching. And some academics chose to exploit the fact that I am not a forester by training in their response to the question. As a young forestry academic at SUA remarked, "these things (plant succession theory) are well-established facts like the way we know that if you go for a haircut, the hair will surely grow back again" (Field notes #40). He was suggesting that some things are so well established that there is no point in questioning them and they have no limitations. Other academics suggested that focusing on the limitations may work to show students that there is little confidence in the materials being taught and that might bring the professors into disrepute. A professor argued "it is embarrassing for a professor to tell students how much he/she doesn't know about a subject or topic" (Interview #36). Students expect that professors have all the answers. Now telling undergraduate students that there is so much that we do not know may amount to embarrassing oneself. This suggest that perhaps professors know the limitations of their knowledge. But they fear that exposing it will taint their scientific authority that rests on the superior knowledge they hold. Focusing on what the available knowledge cannot do is considered an invitation to criticisms. The solution around that is to proceed as if the knowledge is complete.

Forestry academics have argued that undergraduate program is meant to introduce students to forestry. The focus of undergraduate program (by design) is on the basics to build the foundation first. Focusing on limitations and gaps in scientific forestry knowledge will thus undermine that objective. Questioning of the established scientific forestry knowledge is left for the master and PhD programs. While this is maybe true, it further confirms observation that the pedagogy of undergraduate forestry program is carefully crafted to indoctrinate students with their teachers' beliefs in the principles of scientific forestry. Obscuring limitations, gaps, and uncertainties in the

existing knowledge is a *conservation strategy* (the art of ensuring continuity) intended (or not) to preserve the existing scientific order (Bourdieu, 1975; Bourdieu & Passeron, 1990). At the same time, doing so risks producing a false sense of certainty in students. To some degrees, the lecturers appear to believe that ignorance is bliss and choose not to give students all the facts – especially where and when the forestry science is falling short. It is also very likely that professors are unconsciously and carefully protecting their authority – they just take it for granted that teaching is about imparting what they know on students and thus unaware of the political dimensions of doing so.

Since I have come across no work by SUA forestry academics questioning the assumptions underlying scientific forestry, there is no reason to accept the suggestion that questioning of the established knowledge is left for master and PhD programs. At that stage, students who acquired scientific forestry habitus in undergraduate training are unlikely to radically question the basis of scientific forestry. They are likely to work under the assumption that scientific forestry principles are unproblematic and ask questions and propose solutions aimed at doing scientific forestry better.

Further, teaching proceeds as if what is taught represent a set of solutions to already defined problems. The assumption is that the obstacles for achieving imagined forests are already known e.g. deforestation, unsustainable harvesting, shifting cultivation, climate change, inadequate funding etc. All that remain is to apply solutions e.g. rotation forestry, forest reserves etc. taught as laws and beyond question. As pointed out earlier, teaching solutions instead of problem-posing is problematic. Problem-posing and the unknowns (ignorance) are at the centre of scientific advancement. Making a case for teaching ignorance, Jamie Holmes writes in the New York Times: "*Presenting ignorance as less extensive than it is, knowledge as more solid and more stable, and discovery as neater also leads students to misunderstand the interplay between answers and questions. People tend to think of not knowing as something to be wiped out or overcome, as if ignorance were simply the absence of knowledge. But answers do not merely resolve questions; they provoke new ones*"[18] (also see Holmes, 2015).

Mahmood Mamdani reached a similar conclusion in his many writings about the fate of higher education in Africa (see for example Mamdani, 2007, 2010). He argues that teaching solutions instead of equipping students with tools to formulate problems is problematic as 90% of solutions lie in defining problems correctly. The effect is that students are left with the impression that what is already known - theories, concepts, principles, ecological explanations - are a rule and thus they do not develop the level of curiosity needed to challenge them. They end up applying existing

knowledge uncritically and acquire a very static and structured ways of looking at forestry problems.

The absence of contrasting ideas is compounded by the fact that forestry curriculum is compartmentalized by disciplines. Notably, subjects from social science and humanities are missing in the curriculum. Environmental history, environmental anthropology, political ecology, geography, and philosophy of science (theories of knowledge) are omitted from the curriculum. Conservation and forestry suffer as a result as these subjects are specifically designed to provide tools for self-reflection (Bennett et al., 2017). One consequence of not teaching critical thinking is that it makes it more likely to create foresters who are not necessarily well grounded to question and reflect on the knowledge imposed on them. Students of forestry are likely to end up acquiring without challenging their teachers' culture of thinking and doing forestry, which is legitimated in the forest management field. In other words, students are more likely to learn their teachers' conception of problems and family of solutions to these problems rather than learn diverse ways to think about these problems.

The absence of contrasting ideas in forestry teaching described here is not intended to lead to the debate about the right and wrong science. It is more about understanding why certain scientific views are prevalent more than other forms of knowledge. In other words, it is about understanding what makes foresters think that their scientific forestry and its attendant ideas are absolute truths and not a product of the system of thought and ways of knowing that they have adopted. This discussion is intended to illuminate on more than just the absence of scientific disagreements in forestry education. It is also intended to illuminate on the absence of disagreements on the standards against which the disagreements shall be resolved i.e. epistemological disagreements in forestry teachings. The disagreement on whether plant succession theory is universal or not is not just a disagreement on a piece of scientific fact. It is a disagreement also on how that disagreement can be resolved. One camp will take stability in nature position, the other will take a chaotic ecology position. Of interest in our current task is the realization that there are disagreements about the facts of nature (how nature works) and how we can know nature, which obviously reflect the cultural differences. Presenting scientific claims as absolute truth and reflection of reality, and which means everything else is wrong or non-scientific and therefore of lower status, is part of what Bourdieu and Passeron (1990) calls symbolic violence. It is also part of the pedagogy of oppression criticized by Freire (2000).

5.3.4 Other Important features: Materials Distributed in Classrooms as future references and Students' Forestry Association

There are other features of the forestry training that go a long way to creating scientific habitus namely, the type of materials distributed and students' special interest groups. On top of distributing lecture slides, it is a customary practice for lecturers to prepare compendium – a book (paperback, usually unpublished) with digested facts about the subject. A compendium for forest resource assessment was prepared in 1997 and it is still in use today. Materials packaged in this form become important references for students in the future(Lave, 2012b). Students reported being contacted by friends who graduated ahead of them asking for compendiums. Given the rote learning typical of forestry training, students refer to compendium when confronted with real world tasks after graduation. I asked a student, who worked as forester before joining SUA, whether a friend asking for copies of reference materials will apply the knowledge exactly as specified in these compendiums:

> Yes. He has forgotten everything because he memorized them for examinations. Even those who get first class degrees, they just do the same. Some students receive awards as best students in certain subjects, but it does not mean that they understand anything in those subjects. Do not expect that someone who received an award for ecology will be able to tell you anything about succession. (Interview #73).

The author of this thesis can attest to that. He received a first-class degree from SUA. He received awards for several subjects and overall best student award in wildlife management degree program. But his understanding of different subjects was not beyond memorization. The awards did not mean that he learned a lot and mastered the subjects. It was just that he had a knack of telling the kind of questions that will be asked in examinations. He would attend lectures and identify the lecturers' areas of emphasis and anticipate exam questions. There was also a lot of studying past examinations, for there was a high chance that some questions will be recycled. We referred to these past materials as "simbi". The tradition of passing on past papers (symbiotic relationship, hence simbi?) survives today, reinforcing the culture of studying for examinations.

In sum, the way forestry training is structured helps the structuring of students' thinking, feeling, and actions about forests and forestry. That is, the structure enables the creation of scientific forestry habitus. As Lave (2012) observed, targeted materials, overwhelming flow of materials, absence of competing ideas, materials distributed, and field practical component are features that make educative action create scientific habitus.

5.4The content of forestry education

The previous section describes the teaching method and its underlying philosophy employed in forestry education at SUA. The section also contains some discussions of the contents of forestry education at SUA. But that was only necessary to illustrate either the absence of contrasting ideas and/or the pedagogy of depositing knowledge on students emblematic of forestry education at SUA. This section delves deeper into the contents, describing the contents and philosophy underlying the curriculum and what it intends to achieve.

5.4.1 Forestry education content: "Which makes possible the choice of objects, the solutions to problems, and the evaluations of solutions"

A forestry educative action shall "offer distinctive content that ensures that course graduates will focus on a particular set of problems, solutions, and evaluative criteria" for it to produce habitus (Bourdieu, 1975; Lave, 2012: 89). The content of forestry training should reach deep enough to structure participants' mental wiring to subconsciously draw on scientific forestry knowledge in producing practices. In other words, for forestry educative action to be considered habitus producing, it should offer contents that make students think and feel about forestry in only certain ways and only those ways.

Forestry training at SUA offers distinctive contents that enable students ("recipients of educative action") to ask particular questions and propose particular solutions. The training is distinctive because SUA is the only institution in Tanzania offering forestry program – at least as of 2016. Apart from SUA, there is no other educative action in Tanzania with the capacity of producing a distinct scientific forestry habitus or contaminate or challenge habitus created at SUA. Short courses in forestry do crop up occasionally but these courses are mostly delivered by forestry academics from SUA, and they often involve participants previously trained at SUA and FTI. In September 2015, SUA forestry academics delivered a short course on forest resource assessment and harvest planning attracting participants from eight district councils. All participants in this short course attended SUA for their bachelor's degree in forestry and some of them passed through FTI OlMotonyi before joining SUA.

As expected, the forestry curriculum at SUA specifies the program objective and include a list of courses and the syllabus for each. Based on observations and my own experience, syllabuses are shared with students at the start of each course but very summarized. Topics to be covered, when, and the reading list for each topic are included in the syllabus. Readings for most of the courses take the form of compendiums. Students reported that some lecturers are increasingly including

journal articles and books in the reading list. I tried to find out from students about what journal articles they were reading for forest management planning course. None of my interlocutors was able to come up with a journal article reference. In my own undergraduate program at SUA, I remember reading only one journal article (wildlife management, class of 2004). The review of curriculum shows that most of the readings chosen are those that are in agreement with the lecturer views and the dominant views in the forest management field. Readings are not chosen in a for and against the argument basis. Further, few students show up in class having read the assigned literature and thus prepared to ask questions and debate with lecturers. Most students show up in classrooms prepared to acquire knowledge as given.

The forestry curriculum at SUA can be divided into stand establishment, stand management, and wood utilization. Further, the curriculum can be divided into industrial plantation forestry and non-plantation forestry. Irrespective of how one decides to classify contents of the curriculum, the common feature is that it is biased towards industrial/plantation forestry: timber production. Even though aspects of non-plantation forestry have been progressively added to the curriculum, they still are in the background. Even for natural forests contents, plantation forestry is afforded higher priority i.e. management of woodlands for timber production and protection.

Silviculture is at the core of forestry training. The review of the compendium for the course shows that it is taught as a set of rational methods for enhancing regeneration, survival, and growth of trees so that forests can produce products to meet human needs at a required time (Class notes #93). Silviculture contents are imbued with and/or take management of fast-growing exotic species as starting point. Silviculture for natural forests (miombo woodlands) brings plantation culture to uncharted territory – scientific management of natural forests – slow growing species in human inhabited woodlands. In other words, silviculture of natural forests is modelled after the silviculture of fast growing exotic species. Silviculture demands knowledge of the silvics – growth rates, reproduction, and ecological requirements. While some studies have been done, little is known about the silvics of miombo woodlands. The course contents acknowledge this. The silviculture compendium includes lines such as “our current knowledge of regeneration in miombo is incomplete and the few species that have been studied in terms of regeneration all appears to present problems” and “current knowledge of increment and relative vigour of successive coppice or root sucker regeneration does not allow plans on the basis of periodic and mean annual increments in the way this is done for plantations of fast growing species” (Class notes #112 & 113).

Nonetheless, this acknowledgement does not amount to a call for forestry students to forget about trying to apply plantation culture to miombo woodlands. Instead the compendium goes on to

mention “three factors that affect regeneration of trees and that can be controlled are cattle, fire and shifting cultivation. Of these, it is fire that has the most significance in miombo” (Class notes #112). The silvicultural practices recommended for miombo woodlands are thus those targeted at enabling natural regeneration (including enrichment planting) and to ensure sustainable supply of woods. Even though multiple use of miombo woodlands is acknowledged, plantation culture in this case demands for control of activities such as grazing and harvesting to remove ecological constraints. Sustainable supply of woods presupposes rotation forestry and human activities become disturbances. The contents in silviculture course are designed to make students believe that, despite the little ecological knowledge on miombo, it is a job of professional foresters to conduct the interactions between local communities and miombo woodlands, lest the outcomes are deforestation forest degradation, and desertification.

Management planning course teaches students the principles of forest management planning. Among the taught principles is that it is important to consider whether the forest should be managed for production or protection. Further, it is important to consider the biodiversity value of a forest. A management plan cannot prescribe harvesting plan in a forest that is an important water source and that should be managed for national interests, for example. For production forest, it is important to base harvesting decisions on the best measurements. Thus, forest inventory and mapping are “indispensable in forest management” (Field notes #60). Forest inventory generates information on growing stock and thus “it should be done precisely, using appropriate method” (Field notes #60). Forest resource assessment and yield forecasting is taught as part of the same package. For both plantation of fast-growing exotic species and natural forests of native slow-growing species, the current content emphasizes rotation forestry – the practice of dividing forests into blocks to achieve a specified rotation cycle. Rotation forestry is pitched as a way of achieving sustainable forest management, understood as a non-declining supply of timber and other forest products. Ecological sustainability is either considered secondary, too complex to process, or would somehow sort out itself if harvesting stays below prescribed levels.

The other emphasized principle is involvement of stakeholders, including local communities, in the forest management planning. The aim is to ensure that their interests are addressed in the plan and to get their buy in, which is considered necessary for successful implementation of the plan. But the ethos (morality and attitude) of the forest management planning as taught at SUA is that professional foresters shall occupy the driver’s seat to ensure that scientific principles are upheld, and the involvement of communities is merely for instrumental values. Students are made to understand that a management plan prescribes or guide a forest manager on how to manage a forest scientifically and everything else are just adds on. Without a written management plan adhering

to the accepted scientific principles, it is assumed that there is no management and sustainability suffers as a result.

As part of the forest management planning course, forestry students working in groups and individually write a plan for a selected forest. Class of 2016 wrote plans for Kitulanghalo forest reserve, a predominantly miombo woodlands. A review of these plans reveals what a management plan and forestry mean to students. Blocking system (rotation forestry) is the dominant management approach (Management plans #74, #75, and #76). Clustering plot layout and concentric circular sample plots are considered superior inventory technique. The idea that professional forester shall take a driver's seat is evident in the way students describe the approach to engage local communities in their plans. Communities are represented as unaware of the importance and principles of forest management and destroyers of forest whose conducts shall be conducted. Joint Forest Management is proposed wholesomely and uncritically as an approach that would win collaborations from the community. This is yet another indication that government policies are taken as given and students are expected to learn them as being flawless. Critical analysis of government policies is not part of the forestry curriculum.

The content allows students to appreciate the difference between even-aged plantation of fast-growing exotic species and uneven natural forest of slow-growing native species. Silvicultural practices prescribed in the student-written plans are thus in the form of enhancing natural regeneration. It involves restricting access to the forests to reduce disturbances. The other proposed silvicultural practices are boundary consolidation, enrichment planting, boundary planting, and nurseries for native hardwood species. The traditional forest treatments such as thinning and pruning common in plantation of fast-growing exotic species are ignored. Since natural forest of slow-growing native species are uneven-aged and untidy, a slightly modified version of forest resource assessment and harvest planning is chosen. But still, this approach imitates the ideals of even-aged plantation of fast-growing exotic species.

Bachelor's degree in forestry curriculum at SUA also include aspects of wood utilization – wood properties and processing/sawmilling etc., forest engineering – forest works and operations, and forest economics. All these are biased towards industrial forestry and they are all targeted towards maximizing timber production.

As mentioned earlier, ecology is also part of the forestry curriculum. The ecology taught is carefully crafted not to contradict the bulk of forestry embedded in the curriculum – notably that which prioritizes timber production. Without loss of generality, ideas from non-equilibrium ecology are not part of the forestry curriculum. Students are only exposed to the type of ecology,

which support the dominant ideas in forestry. As stated before, this ecology characterizes natural ecosystems as being in directional succession toward an equilibrium climax community – the community that is stable and self-regulating (Class notes #77). After shocks, the climax community is represented as possessing the capacity to work out its way back to the original, steady, and equilibrium state. It is specified in the course compendium that this process can take anything from a year to 500 years. I took up this matter with a student.

> I: *Did the lecturer tell you if he has ever seen a plant succession?*
> R: No. Some of these things are hypothetical. A lecturer will talk about something and then tell you it is hypothetical. But we are expected to pick it up and pass examinations. Another good example is this thing they call normal forest….eh normal forest.
> I: *Me: What is it?*
> R: Normal forest? I thought you understand because you are studying forestry as well. This relationship between yield and age – that they are directly proportional. But then the teacher will tell there is no such forest in Tanzania. It has never happened in Tanzania. It is hypothetical. But you take it for answering examinations (Interview #73).

As this quote illustrate, students pay little attention to theory and theorization. I struggled to find forestry students who could make a connection between practices and its underlying theories and assumptions. When students are learning forest management planning, they rarely engage with underlying theories and assumptions. They just register that management planning is the forestry profession' best practice and that any professional forester worth his or her salt must use one to manage forests.

Biodiversity conservation (measuring and monitoring) is another aspect of forestry curriculum. This takes the form of emphasizing protection of rare and endemic species, protecting catchment forests, and wildlife habitat. The causes for biodiversity loss are summarized in an acronym "HIPPO: habitat loss (including that caused by human induced climate change), invasive species (harmful aliens, including predators, diseases, and competitors that displace native species), pollution, population (human population to be exact, identified as a root cause of the other four factors), and overharvesting (hunting, fishing, gathering) (Lecture notes #78). These elements feature in the management plans written by students. Students' plans include language such as watershed management, soil conservation, boundary consolidation, and buffer zones. Buffer zones are meant to keep local forest users at bay – not to enter the core reserved areas. Interestingly, the training in biodiversity conservation finds "*simplification of genetic diversity and complex ecosystems by planting/selecting monocultures*" as a cause for habitat loss/destruction and thus biodiversity loss (Lecture notes #78). The idea that replacing diverse forests of indigenous species with monoculture plantations of fast-growing exotic species causes biodiversity loss is not emphasized in the core forestry subjects. Protecting lands from human activities is identified as

way to reverse biodiversity loss, further imposing on students the idea that conservation is about separating people and nature.

The content of the bachelor's degree in forestry privileges timber production and biodiversity conservation over local uses of forests e.g. livestock grazing and cultivation. This is still the case despite warnings that management of miombo woodlands cannot be couched in the perspectives of traditional forestry for the woodlands are the source of livelihoods for millions of people in rural eastern and southern Africa. Chidumayo, Gambiza, and Grundy (1996, p. 175) state that,

> In the past, foresters in the miombo region have focused on the management of hardwoods and exotic species for timber production (Grundy 1990; Tuite and Gardiner 1990a; McGregor 1991; Lowore 1993). Their efforts at management of communally owned woodlands have often been based on inappropriate technologies, many of which involved little interaction with local people. As awareness of the importance of the diverse nature of goods and services from miombo woodland to the welfare of rural communities has deepened, it has become evident that a narrow approach to management is inappropriate.

Given the many local uses of miombo woodlands, any attempt to manage them using western scientific forestry is likely to cause conflicts. Specifically, a management approach centred on restricting access to these woodlands is unlikely to win local acceptance. Any attempt to manage miombo woodlands cannot ignore neither grazing nor assume that herding practices are going to stop. Grazing management and access rights should be part of the natural forest management equation. Chidumayo et al., (1996:1993) concludes that "*the way forward to sustainable management (of miombo woodlands) should be to build on existing practices. Past experience indicates that the imposition of new management regimes is unlikely to be successful*". Kajembe (1994) is making a similar argument for indigenous management systems as a basis for managing forests on village land. Notwithstanding all these warnings, the content of forestry curriculum at SUA seeks to impose on students, new management regimes for managing miombo woodlands that do not build on existing local practices.

Local forestry knowledge is afforded a low status in the content of bachelor's degree program at SUA. Not all forestry academics agreed with this observation. They argue that students rely on "local botanists" for tree identification whenever they go out for field practical training. Forestry academics also rely on local knowledge for such things as forest boundaries and trees identifications in their research and when hired to conduct inventory and write management plans. Local communities often help with carrying equipment and at times with taking measurements. Arguably, this goes only as far as recognizing the existence of local forestry knowledge. But it does not reach as far as accepting local forestry knowledge as a legitimate form of knowledge worth including in the forestry curriculum. Forestry academics are using local forestry knowledge

instrumentally to facilitate (rather than improve) the application of scientific forestry. The existence of local knowledge systems is not accepted beyond the use of locals to aid implementation of scientific forestry. It is seen as inferior to Western science.

Klooster (2002) argued that local forestry knowledge is good at certain things, including building strong local institutions for the management of forests. Done properly, scientific forestry knowledge can be good at such things as monitoring forest condition over time. The marrying of the two forms of knowledge is very likely to produce greater results than each applied separately. Suppressing local forestry knowledge makes forestry education at SUA fits neatly into Freire (2000) exposé of the pedagogy of the oppression. It represents a strategy (conscious or not) of enabling students to develop scientific forestry habitus for it is seen as more necessary for forest management than anything else.

Participatory forestry features scantly in the content of bachelor's degree program in forestry at SUA. Some forestry academics disagree. They argue that participatory forestry features in the forestry curriculum. They further argue that through participatory forestry, local forestry knowledge is also part of the forestry curriculum. My observations show that participatory forestry is taught as part of a bigger forest management-planning course and not as a standalone course. It focuses more on forestry than participatory aspects i.e. it puts the forests before the people. Further, it mostly focuses on exposing students to the government policy to involve communities in forest management, and not on theorization of participation and critical analysis of existing policy. Participatory forestry, in this case, is not a means to build on existing local forestry practices. Rather, it is a strategy to extend application of scientific forestry beyond forest reserves. A senior forestry academic put it this way;

> "Before PFM, there was no forest management in these villages. Forests were brutally abused and the situation could have escalated if we had chosen not to intervene – to let villagers decide how to manage forests. It is unrealistic to suggest that villagers can manage forest on their own without government intervention. For instance, you cannot let villages around the source of Ruvu River up in the Uluguru – the source of water supplying Dar es Salaam – choose what they want to do with forests in their villages. They will cut all the trees" (Interview #36).

In the forestry curriculum, villagers are still expected to adopt scientific forestry principles and not rely on whatever local forestry knowledge they may possess. Forestry academics vehemently reject the idea of letting local communities manage forests in their own. Local communities are hungry, they argue (Interview #37). If you leave things in their hand without any form of control, they will certainly destroy the forests. Since local communities are poor and hungry, all they care about is what to eat today and that makes them unconscious of the environmental degradation caused by their activities. While local communities may have the experience to know what tree is

useful for what, their knowledge is limited. Local communities do not quantify things and therefore whatever they know needs to be factored into quantitative rigor of scientific forestry if it is to be useful for planning purposes.

Students also rejected the idea of local communities as forest managers. During the forest resource assessment fieldwork, I suggested to a group of students, most of them with work experience, that the scientific forestry practices are mostly related to plantations, with limited applications to natural forests. They agreed by saying that "these ideas are not directly applicable in natural forest. It is difficult to know parameters such as growth rates in natural forests. It is mostly estimations (guesswork?)" (Participant observation #16 – #25). I continued to probe;

> I: *If management plans and inventories underlying them are mainly guesswork, why not let communities guess as well?*
> Student 1: "Not guesswork. They are estimates, carefully arrived at. If you leave it to villagers, they will destroy the forest. All they want to do is to destroy the forest".
> Student 2: "I am from Kigoma and I have witnessed this first hand. Villagers can quickly turn a healthy forest into a desert. With rapid rate of population growth, they will destroy all the forest".
> Student 3: "In Handeni (a district), what used to be a forest few years ago, it is a desert today".

The content of forestry education described here is indeed "a specific form of educative action, which make possible the choice of objects, the solution of problems, and the evaluation of problems" (Bourdieu, 1975). Recipients of the forestry educative action are taught to use science to manipulate forests (both natural and non-natural) to achieve intended management objectives. Thus, training proceeds under the assumptions that it is possible to do so, to treat forests and obtain some desirable results e.g. trees of a certain species and of a certain size. It is also assumed that with careful planning, it is possible to achieve endless rotations in which every year a certain amount (volume, number of trees) can be harvested without "mining the forest". Ideas opposing and contradicting the dominant views in the forest management field in Tanzania are not emphasized in the content of forestry education at SUA. Because ideas emanating from scientific forestry ideals such as restricting villagers' access to forests are often incompatible with local conditions, we can safely conclude that the content of forestry education at SUA closely resembles the oppression described by Freire (2000), what Bourdieu and Passeron (1990) call symbolic violence.

The contents of the forestry curriculum and education foreshadows the view that scientific forestry is certain and that it always delivers the intended results if principles are adhered to and the alternative is a disaster, non-forestry. However, one would be hard pressed to come up with examples of where scientific forestry has worked out as taught especially in the management of natural forests of slow growing native species. Examples of plantations of tropical tree species

managed as per the principles of scientific forestry are not many. This is not to suggest that scientific forestry is a pseudo-science. But the interest here is to consider the ways in which scientific forestry is taught as universal while it is probably not. As Lave (2012b) observed, universalism and completeness of knowledge are critical in cultivating habitus. If the content of forestry education emphasized on the limitations and uncertainties of the scientific forestry knowledge, it is unlikely that students would assimilate it to the level of internalization envisaged for habitus.

5.4.2 Forestry education: "Epistemic Violence of Colonial Knowledge and Colonial Thoughts"

The quote in the subtitle above comes from an article by Pillay (2015) titled 'Decolonizing the University', which appeared in a critical blog site 'Africa is a Country'. The article was speaking to the ongoing decolonizing movement in Africa and other parts of the world. Pillay (2015) warns against reducing the movement to decolonize (South) African universities to only a fight against political and economic domination (violences). Far more important is epistemic violence, he argues. He writes, "…*epistemic violence, is perhaps the most difficult one to confront. That's perhaps because it is so invisible, so naturalized, so part of the ordinary and everyday life that it's hard to talk about. And yet it is perhaps the most important of the three violences.*" That is so because everything, including injustices and oppression, starts with a thought. Thoughts are predicated on some assumptions that govern knowing and what comes to be considered as good and bad. Pillay (2015) argues that focus on epistemic violence allows for deeper reach than just asking where black students and professors are on the campus. Focusing on epistemic violence generates these questions: "*what are we teaching and researching and how are we doing that and why are we doing that*"?

To ask these questions is to recognize the problem with the colonized minds – when the colonized strive to understand his or her world in colonizers' terms. Colonized minds approve of the problematic view that certain cultures are superior to others and that those cultures should prevail when it comes to understanding the world. Focusing on epistemic violence is also to think about relevance: is the knowledge imposed on students suited to the task of forest management in our environment, social, and cultural contexts? What types of forest are we talking about? It is also to think about effectiveness: to what extent is the imposed knowledge achieving the objectives of sustainable forest management? In his book *Decolonising the Mind*, which is basically about epistemic violence of colonial knowledge and thoughts in literature, post-colonial thinker Ngugi wa Thiong'o makes a similar argument. He writes;

> The real aim of colonialism was to control the people's wealth: what they produced, how they produced it, and how it was distributed; to control, in other words, the entire realm of the language of real life. Colonialism imposed its control of the social production of wealth through military conquest and subsequent political dictatorship. But its most important area of domination was *the mental universe of the colonised, the control, through culture, of how people perceived themselves and their relationship to the world. Economic and political control can never be complete or effective without mental control. To control a people's culture is to control their tools of self-definition in relationship to others* (Ngugi wa Thiong'o, 1986, p. 16, emphasis mine).

It is argued here that forestry education as described above represents a relic of colonists attempt to mental control and to engineer the colonized perception of their environment and their modes of engagement with it. The type of forestry taught in Tanzania is of European origin i.e. imperial forestry. Forestry taught at SUA and FTI remains similar in many ways to the principles introduced by the German colonists to Tanzania in 1890s, which was invented in Western Europe three centuries ago (see Schabel, 1990; Sunseri, 2009). While there have been some incremental changes, the core is still rotation forestry with the aim of maximizing profits from timber and other forest products like what the Germans sought to achieve. Forestry is also grounded on the colonial ideas of separating people from their landscapes with little regards to rural livelihoods.

Scientific forestry as invented by Germans in Germany was modelled for Germans' and related forests. It was not developed with miombo woodlands and the people who depend on it in mind. The complex and diverse miombo woodlands are far from being in order of rows, columns, and tidiness of a single species plantation. Irrespective of this, much of the efforts to manage miombo woodlands have involved mainly trying to apply the German-style scientific forestry. All these efforts assume that scientific forestry is the gold standard of forestry – that irrespective of forest types, the German-style scientific forestry is the benchmark of the best forestry. This is epistemic violence par excellence – foresters from the colonized society striving to understand the world through the lens of the colonizers' culture. Intended results have not been forthcoming but that is not a reason yet for a colonized forester to muster a radical rethink of his approaches to the management of African peopled landscapes. The support for European style scientific forestry is unwavering despite the fact that it was brought to Africa as an instrument of domination and exploitation of her resources.

African forestry science produced for African forests and context is lacking. When African forest scientists are engaged in doing science, their starting point is usually Western science and all they do is to try and translate it to fit African environments. Rarely do they look to produce radically fresh African forestry knowledge free from Western reference for African environments. Done this way, the effect is to replace rather than start with indigenous science and local practices in the generation of scientific knowledge relevant to the African contexts.

Several scholars have decried the absence of African science for African problems, poverty in knowledge production, Africa's scientific dependence, and how these slow down African development (Hountondji, 1990; Mamdani, 2007; Shivji, 2006). Decrying Africa scientific and teaching dependency, Hountondji (1990:6) cites De Certaines (1978:41) who attended the University of Dakar asking, "*how could such a dependent teaching lead to real development?"* De Certaines (1978) cited in Hountondji (1990:5) goes on to write "*....all I could ever do at the University of Dakar was to duplicate European experiments, or to conduct minor experiments that would have to be submitted, for publication, to European journals.*" Hountondji (1990:11) provides a list of indices depicting Africa scientific dependence but the one relevant to our task is the "theoretical or socio-theoretical extroversion" - allowing scientific activities in Africa to be pre-oriented and pre-determined by foreign theories, assumptions, and audience that may not be relevant in Africa's socio-cultural context and environment (Also see Shivji, 2006). This scientific dependence is problematic because Europe and America are not faced with the same problems as Africa. Hence the importance of teaching how to formulate problems for you cannot import solutions (Mamdani, 2010).

By failing to detach from Western forestry science, forestry academics have been designing curricula and teachings that teach students its application with little or no focus on its theoretical underpinning. The refusal to focus on the theoretical underpinning of the Eurocentric knowledge we impart on students (Shivji, 2006) and inadequate focus on problem formulation means we are denying students tools to critically engage with the knowledge they acquire in schools. It means that students not only internalize scientific forestry, the kind they internalize is imported and not necessarily relevant to our environment. Today, the emphasis is more on the number of graduates (product) than knowledge production, more on cramming knowledge based on ideas and assumptions relevant to distant social, cultural, and economic environment. Shivji (2006:2) puts it this way:

> "since the emphasis is on the product and not on (knowledge) production, it is the means of certifying the product that matters. Therefore, we pay more attention to methods of examination rather than the methods of teaching and learning. We divide courses into bits and pieces called modules to enable students to pass examinations rather than devise ways and means of adding rigor to teaching and vigour to learning. We are told that we should test the students immediately after teaching a module so that their memories are still fresh. Is the university education being transformed from the nurturing of minds to the training of memories?"

Overtime, the forestry curricula have not changed in any fundamental way. The subjects taught in 1992 are in many ways similar to those taught today. The underlying philosophy is still the same. The curricula are still laden with exotic plantation thinking, which testify to the African

forestry dependency on its European origin. This is not to say that plantations of exotic species are not useful but rather to point out that environments in African villages are very different from these plantations. Also, the curricula ignore the fact that unlike Europe, people in rural Tanzania cannot be disconnected from the forests. They depend on forests and forested land for agriculture, firewood, grazing, construction poles, medicine/herbal, and rituals. To teach students otherwise is perhaps to engage in fantasy forestry i.e. imagined forestry. The current states of affair in which forestry teachings portend miombo woodlands can be divided into management blocks to achieve rotation similar to compartments of exotic plantation forests arise from the failure of forestry academics to divorce from Western forestry science thinking. That is the failure to generate African forestry knowledge based on ideas and assumptions grounded on local social and cultural values and ecology. In quest for relevance, Ngugi wa Thiong'o offers this advice:

> "In this book I have pointed out that how we view ourselves, our environment even, is very much dependent on where we stand in relationship to imperialism in its colonial and neo-colonial stages; that if we are to do anything about our individual and collective being today, then we have to coldly and consciously look at what imperialism has been doing to us and to our view of ourselves in the universe. Certainly the quest for relevance and for a correct perspective can only be understood and be meaningfully resolved within the context of the general struggle against imperialism" (Ngugi wa Thiong'o, 1986).

A disclaimer. This is not an argument for negritude – forestry science of black African origin and the pride of blackness. We have been warned against doing just that. Professor Wole Soyinka (2013), a Nobel laureate in literature, argues proclaiming negritude is unnecessary by making this analogy: "*a tiger does not proclaim his tigritude, he pounces. In other words, a tiger does not stand in the forest and say 'I am a tiger'* ".[19] A tiger does not brag to prey about being a tiger, he catches the prey. That actions are more important than proclaiming blackness. The decolonization of forestry knowledge discussed here is a call for actions relevant to our forests rather than a call for mere adherence to a certain philosophy. It is a call to rethink about the nature of scientific forestry knowledge prevailing in the management of African forests.

5.5Is scientific forestry habitus uniformly internalized?

Forestry training at SUA is indeed an educative action central to the development of scientific forestry habitus. The forestry educative action succeeds in making possible "*the choice of objects, the solutions to problems, and the evaluations of solutions*" (Bourdieu, 1975). But are scientific forestry dispositions uniformly acquired? There is a notable difference between equivalent and direct entry forestry students. As mentioned before, equivalent entry students are more committed to scientific forestry. With prior forestry training and work experience, the motivation for joining SUA is subsumed under the desire to obtain a bachelor's degree certificate necessary for career

development. As such, they join SUA having acquired several layers of scientific forestry dispositions. What the forestry training at SUA does is to thicken the layers of scientific forestry dispositions. On the contrary, direct entry students start forestry training at SUA with a cleaner slate – with neither prior forestry training nor work experience. As shown before, they are amenable to developing scientific forestry dispositions. They also struggle with understanding forestry principles and visualize its application in practice. For lack of practical experiences in the application of scientific forestry, the layer of scientific forestry dispositions acquired by direct entry students is thinner than that acquired by equivalent entry students. This finding contrasts Lave's (2012) analysis in which participants in non-academic short courses are assumed to uniformly internalize a non-academic model of stream restoration. The implication is that direct entry students are still amenable to liberating pedagogy even after undergoing undergraduate studies in forestry at SUA. In other words, they are more likely to entertain talks about the limitations of scientific forestry knowledge than their equivalent entry siblings.

Similar to students in the short courses described in Lave (2012) whose employers required a specific stream restoration model, potential employers of forestry graduates in Tanzania are almost certain to require knowledge and skills in scientific forestry. Direct entry forestry students know this but are not entirely sure about how they are going to apply the scientific forestry knowledge. Then, there are those students who are just about to graduate but are still thinking they are in the wrong degree program. These students are still going to acquire scientific forestry dispositions, but they are not fully committed to the forestry profession yet. The priority for them is to obtain the degree and then worry about what to do next. The difference is, while others have accepted forestry as a career and therefore think about the application of the knowledge imposed on them at SUA, those yet to commit are unlikely to worry about the application. There is thus no reason to think that students intending to forge a career outside of the forest management field will acquire the same amount of dispositions as those already committed to a career in forestry.

5.6 Neoliberal offensive: Discontinuation from the university is a thing of the past

Like the global trend in higher education, SUA has not been immune to the neoliberal offensives (Zeleza, 2016). The ongoing restructuring at SUA and other universities in Tanzania is a direct response to the market forces and continuation of neoliberal thinking in higher learning that kicked in under Structural Adjustment Program spearheaded by the Bretton Woods institutes in the 1980s (Chachage, 2001). The public funding for higher education has been declining gradually ever since and replaced by fee-paying students. Massification is a key feature of market-based model of higher education (Zeleza, 2016). There has also been a mushrooming of short courses, private

universities and colleges, and in general universities are now expected to run like businesses. Multiplying students' enrolment is a common strategy used by universities to boost revenue collections. The privatization of higher education is today the new normal (Mamdani, 2007, 2010). So, does the commercialization of knowledge. The focus shifts to producing knowledge that can be sold for profit. Patenting and establishment of business units are key feature. The restructuring at SUA and other public universities is basically the privatization and commercialization of knowledge to generate more revenue for the university. The restructuring involves decentralization of power to lower academic units at the university, to give them more freedom to innovate revenue generating programs including short courses and degree programs in high demand. The aim is to attract more students and thus generate more revenue.

The massification of higher education means big classes and this has a bearing on the quality of teaching. Big classes inhibit learning for understanding, which is necessary if one is to be able to question a well-established knowledge. A professor described the situation as follows:

> Lab sessions have been reduced to demonstration. There are just too many students to fit in a lab and we do not have sufficient equipment. We do not have enough microscopes to divide students into smaller, manageable groups. Lab technicians do what they can do – just demonstrate experiments and leave it there. I am sure these students will not be qualified to do that much after they leave SUA. I wonder who is going to employ them. But I can assure you that the situation at SUA is much better compared to other universities around. We are still trying to maintain some standards. But if for instance these students are made to compete with their peers from Europe, Asia, America, it will be embarrassing. A big shame (Participant observation #80).

Other lecturers are not shy of narrating on how they are adapting to the situation. It is common to hear lecturers mentioning that they are either designing examinations that are easier to mark and/or administer few of them in response to big classes. To generate more revenue, programs offered are decided based more on their marketability than anything else. Degree programs, contents and structures that are thought to undermine revenue generation goal are considered irrelevant. At SUA, new colleges and departments are introducing new degree programs and short courses that will be attractive to prospective students. SUA is also devising strategies to ensure that her graduates are employable or graduate with skills they can use – a certain way of protecting future markets.

The other marketing strategy pursued by SUA is to ensure high graduation rates. Spending four or five years for a three years' program and discontinuations do not augur well for the future recruitment drives. The rates of discontinuation have declined significantly, not necessarily because today's students are smarter or that the quality of teaching has improved. The main reason seems to be a decline in public funding of higher education. Academics report finding it difficult

these days to declare that a student has failed. They are feeling more pressure nowadays to carry along failing students who were not supposed to be enrolled at the university in the first place (Participant observation #32). This is related to an issue of prioritizing revenue generation. More students mean more revenue to the university through tuition fees and other charges, and students' retention helps protect future markets as high turnover of students scare away prospective students. For these reasons, the ongoing restructuring is expected to deliver changes in curriculum and mode of delivery for the existing degree programs to increase graduation rates.

Producing skilled and employable graduates is important. The university should be able to teach skills. Further, in situation of a decline in public funding, it is important for the university to ensure that it is generating enough revenue to finance its activities. In these situations, market-driven curriculum shapes the content and mode of delivery and assessment in a way that inhibit questioning the established form of knowledge. At the same time, jobs are few and competitive. Universities are thus constrained to produce only what the market can absorb – what the market is not interested in does not get produced. Achieving this require a great amount of knowledge about what the market wants – what sort of graduates are sought after by employers. In this way, production of scientific forestry knowledge proceeds with the awareness about how it will be circulated and applied. This approach does not favour questioning the very knowledge privileged in the market. It stabilizes the existing and authorized domains of knowledge. The implication is that the market for scientific forestry knowledge would only require the production of the same type of knowledge and graduates.

Neoliberal offensives further reinforce the tendency of teaching solutions as opposed to problem-posing (Mamdani, 2007, 2010, 2011). In this way, students inherit most of the biases in conceptualizing the problems that exist and perpetuated by the lecturer. Because the focus is more on imposing solutions than formulating problems, students are unlikely to pick up flaws in the dominant form of knowledge. As Chachage (2001, p. 7) puts it, universities, unlike vocational training "which produce operatives", have more role than just imparting technical skills: "universities are primarily charged with the task of cultivating analytic skills and developing critical faculties/thinking in the students". He argues that turning the university into "supermarket" makes it difficult to create "an environment with vibrant intellectual life" (Chachage, 2001, p. 7). The role of university education cannot be just to produce graduates with technical skills valuable in the marketplace. Doing so reduces the university to a factory, education/knowledge to a product, and students to customers as opposed to learners. The role of a university should include developing critical faculties in students. Knowledge, improved understanding of natural and social worlds and improved ability to evaluate evidences and make an argument, is an end in itself. All

these consequences of neo-liberalisation of higher education means one thing in our current task: it creates a fertile ground for the pedagogy of oppression, symbolic violence, and the perpetuation of existing scientific order.

5.7 Conclusion

This chapter sets out to examine whether forestry education at SUA is liberating or conforming to the dominant views in the forest management field. A liberating pedagogy is problem-posing; the conforming one is banking, seeking to deposit knowledge on learners as we deposit cash in our bank accounts. As we saw in this chapter, elements of the latter are more ubiquitous in the forestry pedagogic action at SUA. The forestry pedagogy is far less about problem-posing than the transfer of knowledge from the knowledgeable lecturers to clueless students. Further, we see that teaching emphasizes the known in which knowledge is generally presented as being complete, obscuring its limitations. The content of the forestry education at SUA is skewed in favour of scientific forestry. There is a notable absence of courses from other disciplines such as humanities and anthropology in the forestry curriculum. Thus, students have less encounters with ideas that challenge the materials taught in classrooms. Further, the curriculum is bereft of contrasting ideas. It is imbued with ideas from equilibrium thinking. Ideas from non-equilibrium ecology are suppressed. Neoliberal offenses of favouring market-based solutions to higher education challenges are not helping either – they further reinforce conformity and order for markets dislike disorder.

For the absence of questioning of dominant form of knowledge and suppression of contrasting ideas, forestry education at SUA epitomizes the pedagogy of oppression as defined by Freire (2000). The forestry education is thus symbolic violence for it seeks to preserve the subtle and misrecognized oppression by cultivating categories of thoughts that naturalize just that (Bourdieu, 1975; Bourdieu & Passeron, 1990). By producing the scientific forestry habitus defining the forest management field, the forestry education at SUA is thus partly or wholesomely responsible for the oppressive practices such as the scientific framing of CBFM and the preoccupation with sustainable forest management at the expense of local livelihoods. It is through forestry education as organized and conducted at SUA that the dominant in the forest management field succeeds in building a base of support for scientific forestry knowledge they possess (Lave, 2012b).

Forestry academics play a pivotal role in the creation of scientific forestry habitus. But this chapter says little about the role of forestry academics – their activities and how they go about conserving the well-established form of knowledge in forestry – the knowledge they possess and authorize.

The next chapter is devoted to examining the role of forestry academics in the production and reproduction of scientific forestry habitus.

Chapter 6: Forestry academics role in the perpetuation of the existing scientific order in the forest management field

"Today, the market-driven model is dominant in African universities. The consultancy culture it has nurtured has had negative consequences for postgraduate education and research. Consultants presume that research is all about finding answers to problems defined by a client. They think of research as finding answers, not as formulating a problem. The consultancy culture is institutionalized through short courses in research methodology, courses that teach students a set of tools to gather and process quantitative information, from which to cull answers." (Mahmood Mamdani, 2011)[20]

6.1 Introduction

In the previous chapter we explored the structure and contents of professional forestry education and concluded that it reproduces the established scientific order. Perpetuation of the order involves "the aggregate of the institutions responsible for ensuring the production and circulation of scientific goods together with the reproduction of the producers (or reproducers) and consumers of these goods" (Bourdieu, 1975). This chapter asks what role forestry academics do (producers and reproducers) play in keeping the authority of scientific forestry. It examines the activities of forestry academics, namely research and consultancy, for how they perpetuate the established scientific order – the one in which scientific forestry knowledge comes first and predominate. Of interest is the censorship they apply to separate science from non-science i.e. the problems, methods, and solutions that are considered scientific and non-scientific. In doing so, the chapter also examines the extent to which the scientific field dominated by forestry academics is influenced by ideas and thoughts from within in an attempt to test Bourdieu's (1975) thoughts about the autonomy of a scientific field.

6.2 Forestry Research

Bourdieu (1975) argues that scientific field is a social field with its politics and what is at stake is a scientific authority. Research is one of the activities forestry academics engage in and which shape the politics in a scientific forestry field. It is through research that forestry academics produce scientific forestry knowledge. As is the case with any other scientific practice, scientific forestry knowledge is usually communicated through publications. Publishing is an act that confer scientific authority to a scientist. Number of publications is no longer sufficient to declare a scientist an authority in a particular field. Place of publication, whether a publication was subjected to a peer review process, and the number of times peers cite a publication are more important today in sizing up the authority of a scientist. Journals with high impact factor (the average number of times an article in a journal has been cited for the past two years[21,22]) confers higher authority. Based on this prestige criterion, publishing in the journal Nature which has an impact factor of

41.456 in 2016[3] is not the same thing as publishing in the African Journal of Ecology which has the impact factor of 0.69[23] in the same year.

When I presented the draft of this chapter in a refereed seminar at SUA in early August 2017, forestry academics rued my use of research published in the in-house journals, the Faculty of Forestry Records (1978 – 1994) and Tanzania Journal of Forestry and Nature Conservation (1994 onwards), to judge the types and topics of research conducted at SUA. The younger generation of forestry academics argue these in-house publications are things of the past. That they do things in modern ways and the current times require publishing in high impact factor journals – suggesting that the in-house journals are not among the high impact factor journals. They also suggested that there has been a break to the old ways of thinking in forestry and we have had a paradigm shift of the proportion described by Kuhn (1970). Participatory forestry management was provided as an example. It is crucial to readers that the aim here is to find out whether only certain types of questions and topics are researched and whether these have evolved over time, if yes how and why. More importantly, the aim is to find out how the 'paradigm shift', if any, have altered or left undented the dominant thinking in forestry (scientific forestry) and its underlying assumptions. The lack of questioning of the underlying assumptions would be an indication of censorship as defined by Bourdieu (1975).

The question of high impact factor journal is interesting. The Government of Tanzania prescribes the following requirement for an in-service academic staff to be promoted to the professorship:

> "By promotion of an Associate Professor with a PhD and at least three years of work experience since last promotion and at least 9 points since last promotion (2 cumulative points from international peer reviewed publications from at least two sources including a maximum of 45% from diversified journal publications) (URT, 2014, p. 21)".

The government further prescribe that a journal paper carries a maximum of 1 point. These prescriptions are translated into SUA's *Up the Ladder* document almost verbatim in which a paper in recognized international journal is required for promotion and the full point is awarded if the paper is graded 'excellent' by internal reviewers (SUA, 2015b). In a co-authorship situation, the single point shall be shared equally amongst the authors (SUA, 2015b; URT, 2014). Impact factor is not emphasized in the *Up the Ladder* document. It is only mentioned once that the "authors must provide information to the Heads of Departments whether their articles are published in open access journals, whether the journal is registered with ISI Web of Science or other online indexing database and whether the journal has an impact factor or not" (SUA, 2015b, p. 50). The minimum impact factor for journals is not specified. Neither does the frequency of citation for SUA academics papers. Under these rules, impact factor appears less important than whether the journal is registered with ISI Web of Science (meaning impact factor is calculated). That publishing in

journal Nature and African Journal of Ecology suddenly makes no difference at SUA.

6.2.1 Applied research: The unquestioning of the premise of scientific forestry

> *People cannot foresee the future well enough to predict what's going to develop from basic research. If we only did applied research, we would still be making better spears (George Smoot).*[24]

The quote above, which is associated with George Smoot, suggests that basic research might seem less important for not having immediate practical or commercial use. But he warns that in absence of basic research, science will not progress, and applied research would be monotonous – involving just perfecting the same set of solutions (making better spears) to practical problems because the understanding of these problems remains unchanged. The advancement of science fuelled by basic research allows understanding of problems to evolve, which allow premises on which applied research is based to also evolve. As we will see for the case of scientific forestry in Tanzania, it appears we have been making better spears for the best part of history. The premises on which scientific forestry is based are rarely questioned irrespective of the fact that forest types upon which they are applied are changing. Applied research rarely considers redefining problems because the focus is mainly on maximizing timber (& other forest products) production, biodiversity conservation, and stopping deforestation.

Mahmood Mamdani (2011) observes that preoccupation with applied research can make one mistake research for only about finding answers to practical problems.[25] In his monograph, *Scholars in the Marketplace*, Mamdani (2007) use the case of Makerere University in Uganda to illustrate problems with market-based reforms of African universities. One of the many impacts of the reform was a decline in basic sciences. Mamdani (2007:84) quotes the Dean of Faculty of Science at the university saying the impact had been:

> 'a shift of emphasis from basic sciences to applied sciences'….'If the basic sciences disappear, all others will disappear. Basic sciences produce knowledge for others, and produce teachers (biology, physics) for others. Basic courses generate scientific knowledge'.

The argument is not that applied sciences are bad or unnecessary. This could not be further from the intention here. The relegation of basic research to the lower division for lacking immediate application or use in the market implies that there is little theorization and questioning of the established concepts going on. This way, the established scientific forestry model is unlikely to be disrupted or modified.

The distinction between basic and applied research is perhaps more relevant and applicable to classifying research in natural science than in social science and humanities. Roll-Hansen (2009)

proposes a yardstick to differentiate basic and applied research. Success of applied research is judged by the extent to which it resolves the identified practical problem. Funders of applied research are looking to further their own mission and thus they often choose problems to be worked upon by researchers and delimit the conception of problems. Example of this can be a research to develop volume and biomass models for miombo species with the aim of supporting carbon market. On the contrary, success of basic research is judged by the extent to which it contributes a new idea to the existing theoretical understanding about a phenomenon of general interest in a particular discipline. Participants in the scientific field are the first to judge how important the discovery is. The product of basic research has no immediate application or use in the marketplace. Basic science researcher is often motivated by own curiosity. Basic research has the potential to fundamentally change our understanding of nature and thus it can challenge some of the taken-for-granted assumptions in the field. A research to understand/test plant succession theory or the balance-in-nature theory is a good example of basic research. Established theories would continue to be applied as if it were true reflection of the natural world up until when replaced by a new paradigm.[26] While scientific progress is not linear (it moves from one paradigm to the next, creating partial views in the process), there is substantial communication between paradigms (Sismondo, 2010).

For our purpose here, basic research refers to those engaged in ecological theorization, critical testing of existing ecological theories and approaches in forestry i.e. research making ecological concepts a core topic of study. It also refers to the research seeking to understand ecological process for the sake of it and not because the information is urgently needed to inform timber management. Critical policy research is hereby classified as basic research. A paper was judged as basic research if it contains elements of ecological theories, for example succession, re-sprouting, regeneration, succession, species richness, composition, and diversity, taxonomy, and species distribution. On the other hand, applied research refers to those oriented towards maximizing timber (and non-timber forest products) production i.e. research conducted to address a particular timber management problem. It also includes research conducted to enable market – based resource management policy. The primary concern of applied research is application and not theorization and conceptualization. A paper was judged as applied research if it is heavy in timber/production/management concepts. The indicators were exotic species (eucalyptus, pine, Pinus, Cuppressus, teak), timber yield, biomass and volume modelling, wetlands management, Leucaena, agroforestry, nursery, spacing, REDD+, non-timber forest products, and participatory forestry.

The distinction employed here is for convenience only. For one thing, the definition of basic research is very much relaxed here. For example, a research to understand regeneration is judged as basic research but it may be intended to justify a management decision related to charcoal production and thus has nothing to do with critically questioning the basic tenets of plant succession theory.

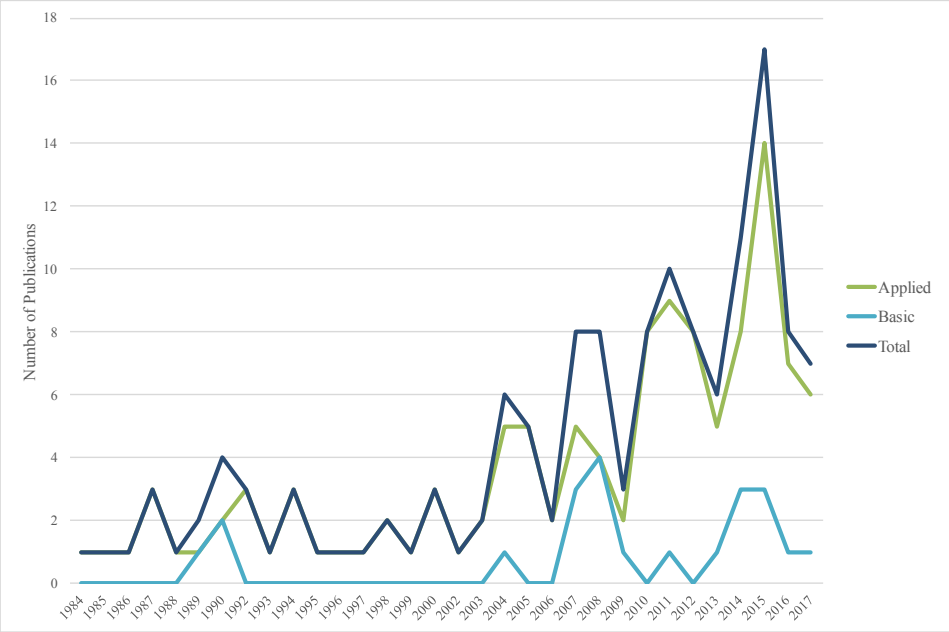

Figure 3: Applied versus Basic Research Completed by SUA Forestry Academics

Based on these criteria, data obtained from the Web of Science/Knowledge searches shows that research conducted by SUA forestry academics is heavily biased towards applied research. Out of 139 publications, 117 (84%) were judged as applied research. Figure 3 shows the trend in basic and applied research in relation to total research in each year since 1984. Research published by SUA forestry academics are mostly about how to make these species perform better in different conditions in Tanzania (Example: 'Height graded *Eucalyptus tereticornis* seedlings: One year yield performance'), justifying state intervention and technical solutions to seemingly political problems (Example: 'Resource use conflicts in Usangu Plains, Mbarali District, Tanzania'), and seeks to provide metrics for market – based environmental policy such as REDD+ (Example: 'Models for estimation of tree volume in the miombo woodlands of Tanzania'). These studies are important in shaping and operationalizing the policy. If anything, they only question policy for not adhering to the 'best practices' as prescribed in their research, especially during implementation.

Research asking how to better implement a policy or manage a plantation (e.g. how community can be engaged to monitor carbon) as opposed to what is wrong with the existing definition of the

problem/conceptualization (e.g. doubting the framing of deforestation that lend itself to carbon market as a solution) are necessary in keeping the existing scientific order but not sufficient in ensuring pluralism in forestry knowledge. To be certain, few scholars engage in critical policy research intermittently, but these are mostly led or instigated by outsiders. A good example is a study titled 'Inverting the moral economy: the case of land acquisitions for forest plantations in Tanzania' published in 2015. This study, led by outsiders but involving a SUA forestry academic, problematizes the notions that "trees are axiomatically green, 'idle' land is a waste land, and economic investments are beneficial to the relevant communities" to question the growing trend of land acquisition for establishing forest plantations in Tanzania (Olwig, Noe, Kangalawe, & Luoga, 2015). But studies of these nature are rare with the SUA forestry academics. Even those studying resource use conflicts rarely engage with critical literature in *Science and Technology Studies* and *Political Ecology* (Example: 'Resource use conflicts in Usangu Plains, Mbarali District, Tanzania').

Even the basic research (those ecological theories elements) are not entirely engaged in problematizing existing ecological theories. As an example, research on succession/regeneration focuses more on whether miombo species regenerate or not and not so much on why and how (Example: 'Regeneration by coppicing (re-sprouting) of miombo (African savanna) trees in relation to land use'). These studies presume regeneration and therefore seek to find out whether it occurs or not in order to offer management prescription.

After finding more coppicing on public land than protected area, Luoga et al. (2004, p. 23) argue that "due to the prolific coppicing of trees in public lands, it is recommended that the woodland should be managed using coppice rotation as a silvicultural systems". These studies are mostly based on the stability in nature assumption – randomness and unpredictability are given little urgency. Certain order/succession is expected and if it is not observed, the task of a researcher is to find the probable causes and prescribe management interventions. Disturbances – things that upset the plant succession e.g. wind and livestock grazing - are considered external to the ecological system (Example: 'Sprouting, succession, and tree species diversity in a South African coastal dune forest'). Invoking stability in nature assumptions means that management interventions are most likely to take the form of regulating local communities' interactions with miombo woodlands for research as framed is unlikely to get to the core of complexity of these ecosystems. As a result, it is unlikely for these studies to uncover some random factors influencing species composition and be appreciative of the unpredictability of natural ecosystems. All these create a fertile land for privileging the singular scientific forestry model.

Applied research at SUA is hegemonic. The neoliberal offensives embraced by higher education institutions are not helping. Researchers are actually encouraged to do more applied research and not simply produce science for the sake of it. The current wave of encouragement for more applied research assumes that researchers were not engaged in applied research already. It turns out that the campaign now is to commercialize science and shift the focus to producing science that can be commercialized because the university is in dire need to generate incomes. On July 22, 2016, there was an event at SUA with the theme "Turning Great Ideas and Innovations into Business Opportunities".

6.2.2 Policy Recommendations Type of Research

> *"Forest resources have a role to play in Tanzania's economic development in several ways. To manage these resources scientifically, input from forestry and related research is necessary. Such research must provide answers to forest resources management questions. Currently, the contribution of forestry research to socio-economic development of Tanzania is modest" (A.S.M. Mgeni at a Joint Seminar on Forestry Research in Tanzania under Sokoine University of Agriculture and Agricultural University of Norway Cooperation held in 1990, Faculty of Forestry Record No. 53).*

The quote above illustrate that it has long been the ambition of forestry scientists to prioritize not only on applied research but also on providing policy recommendations necessary for national development.[27] As mentioned in the previous section, even what is classified here as basic research (ecological research) aims at providing recommendations to improve rather than disrupt the status quo.

At SUA, it is a widely-held consensus that research producing no policy recommendations is a waste. That it is a waste of resources to engage in a research with no known policy recommendations. Students' research at undergraduate, master's and more so PhD level are assessed for, among other things, policy recommendations. These types of research are arguably necessary because forestry academics are keen to contribute to the development of the nation. Academics are often criticized for not doing just that and hence the urge to do so. Funders of the research expect policy recommendations in the form of actions to solve a practical problems. Contributing to national economic development is without doubt a noble cause but there is one problem to the culture of doing policy recommendation research only. Treating forestry research as only about finding solutions to management problems leave the premises of scientific forestry largely unquestioned and therefore unaltered. The manner in which forestry academics conduct their research conceals the possibility that something in their central model for doing forestry is broken. When their recommendations fail to produce the intended results, poor policy implementation is often blamed. Few, if any, cast doubt on the infallibility of the models underlying scientific forestry. In the language of Thomas Kuhn, scientific forestry is considered a

'normal science'[28], in the sense that it "is predicated on the assumption that [forestry] scientific community knows what the world looks like" (Kuhn, 1970).

Speaking at the first annual forestry research workshop held in March 1997, Z.S.K. Mvena, a non-forestry academic at SUA argued that [scientific] forestry was anything but normal science for it failed to account for biodiversity conservation. He writes, "historically, forestry has been responding to the needs of society and not necessarily addressing issue of biodiversity. It is the contention of this paper that forestry is responsible for the apparent erosion of biodiversity. Plantation forestry has often involved clearing the more diverse indigineous forests and replacing it with monocultures" (Mvena, 1998). He continues by providing suggestion "to re-orient research towards the needs of both society and ecological systems as well as understand in the broadest sense possible the impact of our past errors" (Mvena, 1998). For one thing, Mvena is arguing that most of the forestry research has been about plantation of exotic species and that knowledge of plantation forestry is not universally relevant. That the preoccupation with maximizing timber production is harmful to biodiversity. He rues replacing natural diverse forests with monoculture plantations. He is not explictly speaking to the ecological and social impacts of employing plantation culture in the management of natural diverse forests (native species). Perhaps that is implied in the call to re-orient research towards understanding of ecological systems. A focus on understanding the ecology of natural diverse forests would arguably lead to questioning of the assumptions underlying the normal science.

Despite the call to re-orient research, little have changed in forestry research. To be certain, new research topics such as participatory forest management and REDD+ have entered the scene. But still, research is skewed towards industrial forestry with the prime objective of maximizing production of timber and to a lesser extent charcoal. Forestry research proceeds as if PFM is an extension of the dominant form of forest management and not as an alternative to it. PFM is thought of as a strategy for applying scientific forestry where none exist. Thus, some of the research by SUA forestry academics are seeking to find ways for using local communities as data collectors. Some research rues as a threat and weakness the low capacity of local communities to follow and implement scientific forestry and recommend that local communities shall be educated to improve their technological understanding if the future of CBFM is to be secured.[29] These researches are aimed at technicalising PFM by finding ways to make local communities embrace scientific approaches. This is far from representing a break from the past practices.

A look at the Faculty of Forestry Records reveal that out the 47 records published between 1978 and 1990, 40 records were on industrial plantation forestry with *Pinus patula* and *Cupressus lusitanica* being the most studied exotic species (Kowero, Campbell, & Sumaila, 2003).

Publications on natural diverse ecosystems (miombo woodlands) were underrepresented. In 1979, one study appeared on the volume estimation for miombo woodlands (Temu, 1979). A handful of other studies on miombo concerned forest engineering and in particular on how to reduce impact of harvesting. Forestry academics dispute this for Records are a thing of the past and argue that today, miombo woodlands is among the most studied biomes. They are probably right. Today, when questions are being asked on the sustainability of harvesting miombo woodlands and when carbon stored in trees is a commodity, studies on volume and biomass estimations have picked up.[30] A look at the Web of Science data (Text search 'miombo' in Nvivo) reveal that 65 of studies out of 139 studies (47%) (Figure 4).

A major research project, MITMIOMBO (Management of Indigenous Tree Species for Ecosystem Restoration and Wood Production in Semi – Arid Miombo Woodlands in Eastern Africa), was implemented between 2006 – 2008 under the leadership of Finnish Forestry Research Insititue. The project aimed at "coaching Tanzanian researchers in the application of state-of-the-art research methods for addressing management challenges involving indigenous stands with complex structures and dynamics"[31] based on the recognition that indigenous forests and woodlands are much more complicated than plantations of exotic species. Another major study, Miombo Project, was undertaken by CIFOR around the same time and explored the linkages between rural livelihoods and miombo woodlands.

Most of this research focused on the miombo woodlands' goods and services. The research was conducted with timber, carbon, and charcoal in mind, and they were concerned with how much to harvest. A search for "volume estimation in miombo" in Google Scholar returned 39 publications in the first 15 pages with at least a SUA forestry academic as a co-author for the period beween 2008 and 2017. A book on the volume and biomass models for miombo woodlands in Tanzania, among other forest types has also appeared (Malimbwi, Eid, & Chamshama, 2016). The book is a collaboration between forestry academics working with their PhD students, foreign collaborators, and forest service staff. In all these studies, the core assumptions underlying scientific forestry is maintained.

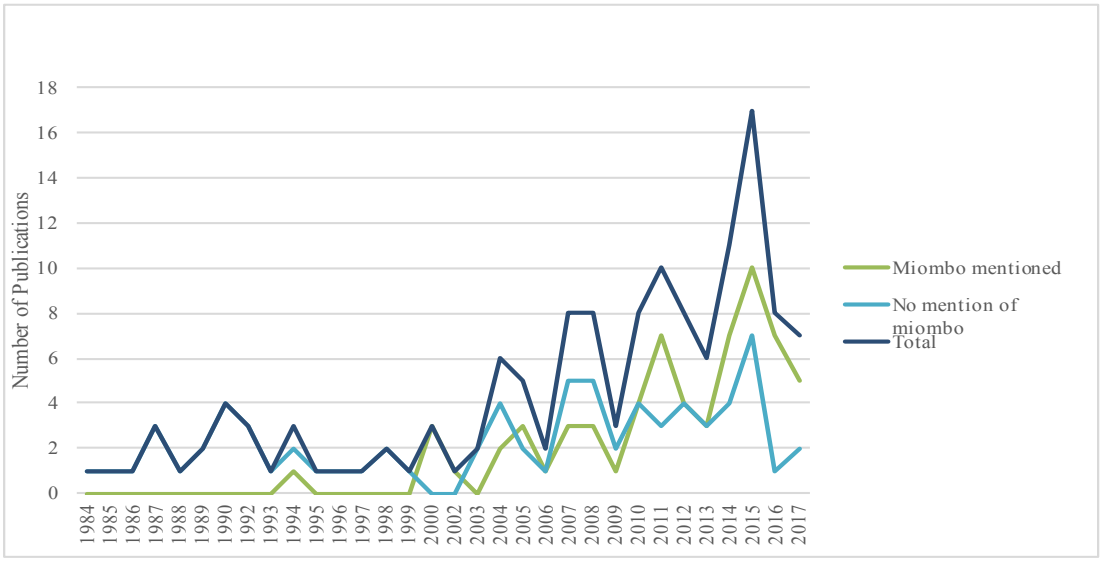

Figure 4: Trend in Research on Miombo

As mentioned in the previous section, even the research classified as basic research in this thesis is more inclined to provide policy recommendations to maintain the status quo and shows little interest in questioning the established views in forestry. One would expect that assumptions that are probably true in a plantation of exotic species to not fit neatly when applied in miombo woodlands. Yet, research on the miombo woodlands mostly take principles relevant to plantation forestry (exotic species) as a starting point and all assume that a forester intervention is warranted. Further, the miombo woodlands functioning is less studied. The research just assumes that miombo woodlands exhibit equilibrium dynamics of a climax vegetation and that certain levels of disturbance e.g. prescribed harvesting levels can be withstood. The possibility that miombo woodlands may exhibit non-equilibrium dynamics (random and unpredictable changes in unknown driving forces) is ignored (Frost, 1996; Sullivan & Rohde, 2002). The control of fire and grazing is generally considered good, without allowing for the possibility that something unexpected might occur. Removing grazing from miombo woodlands might give rise to something unpredictable. This is certainly a possibility because we often work with short time scales: history of these landscapes dating back 200, 300, 500 years are often unknown. The research focus on miombo woodlands' goods and services also ignore the question of whether miombo is nutrients- or water-limited or both (Frost, 1996).

One would be hard pressed to come across any research by forestry academics that treat miombo woodlands as entirely different type of forest that require fresh thinking to generate knowledge specific and relevant to miombo. The core forestry principles remain unchanged despite changes in forest types. Forestry academics work under the assumption that scientific forestry ideals of

measurements, calculations, timber production, and forester's manipulation of forests are universal. They are thus constantly trying to fit all types of forests into that model. The result is mostly 'imagined forestry' (Hansen & Lund, 2017) especially when it involves management of miombo woodlands. Since forest research as currently framed aims at providing recommendations to improve on the government policy or to address problems as identified and defined by the government (e.g. deforestation), only types of questions intended to achieve just that are likely to be raised. By not asking diagnostic and disruptive questions, forestry academics are effectively (consciously or unconsciously) censoring knowledge production with the aim of perpetuating the existing scientific order (Bourdieu, 1975). Since it is taken for granted (doxa) that scientific forestry principles are universal, a forestry academic is expected to conduct research upholding these principles and providing recommendations ensuring that policy is as scientific and technical as possible. Doing anything to the contrary carries a risk of being labeled unscientific and not belonging to the forestry scientific field.

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6.2.3 Choice of Research Topics as Struggle for Domination: Research topics follow rather than precede funding priorities

The choice of research topics appears to trace funders' funding priorities. But a forestry academic objected arguing that each department set its own research priorities and documents exist to attest to that. That I should review these documents to appreciate how research topics are not imposed by funders. The observation that research topics follow funding priorities despite the existence of home-grown research priorities is not new. Commenting on the inadequate research funding at SUA, Malende, Mgeni, and Malimbwi (1992, p. 66) write about the mismatch between funders' interests and identified academic departments' research priorities; "Funds from foreign sources may sometimes come with specification of the area of interest which is not a high departmental research priority area". Making this observation is not to reject the existence of value – free departmental research priority area. It is rather to problematize a claim that the overlap between departmental research priority area and funding priority is coincidental. It is also to problematize a suggestion that departmental research priority area precedes funding priority.

Error! Reference source not found. shows the overlaps between research topics and funders' priorities. As it can be seen, research conducted by forestry academics neatly traces funding priority. This suggest that the forestry academics' choice of research topics follow rather than precede donors' priorities irrespective of what departmental research priorities are. In the advent of Norwegian support to REDD+ process in Tanzania, a research project funded by the same donor was conceived as part of REDD+ pilot in Tanzania. The research project was a collaboration between Tanzanian institutions including SUA and Norwegian institutions.[32] It would be hard to

argue that the program was conceived independently at a local institution, especially because the project was an offshoot of Norwegian interest in and massive funding on REDD+ at the global level.

Table 4: Donor funding priorities and Academic's research topics

Year	Donor Priority	Research by Academics
1960s, 1970s, 1980s	Industrializing the forest - Norway, Denmark, Sweden, UK, Germany, the World Bank	Silviculture (seed germination, plot test of exotic species, tending) Wood utilization (harvesting, sawmilling)
1970s, 1980s	Village forestry (afforestation, agroforestry) - SIDA Sweden	Woodlots ICRAF *Leucaena leucocephala*
1980s, 1990s	Biodiversity conservation - FAO, UNEP, WWF, IUCN, Sweden, EU	Restoration, species composition, species richness
1980s, 1990s	Involving the community - Sweden, GTZ, Norway, World Bank	Natural forests, Indigenous knowledge
2000s	Wetlands management - Denmark	Wetlands management
2000s - 2010s	Participatory Forest Management - Norway, Finland, Denmark, World Bank, Sweden	NTFPs Lesser known species, Impact of PFM Miombo ecology
2000s - 2010s	REDD+ - Norway	Model for carbon estimations/ GIS/ Remote sensing
2010s	Harvesting in VLFRs/Second generation CBFM/ Forest value chain - Finland	Volume modelling/ Inventory methods
2010s	Private/village plantations/ Forest value chain - Finland	Value chain analysis

Source: (Hurst, 2004 ; Field data)

The same can be said about forestry academics interest on topics such as wetlands management. In 1999, Tanzania acceded to the Ramsar Convention on Wetlands (MNRT, 2003). At the same time, Tanzania designated Malagarasi-Moyowosi wetlands as the first Ramsar site in the country. Soon after, DANIDA (Denmark) started to support Tanzania to implement the Ramsar convention. In 2000, an international technical adviser was stationed at the ministry for that purpose. Danida-funded Malagarasi-Moyowosi project started in 2001. At around 2003, Danida started to support a parallel sustainable wetlands management program at the national level aimed at setting up a structure for wetlands management in Tanzania. Forestry academics served as consultants to these programs/processes. A course on wetlands management was introduced to the wildlife management undergraduate program at SUA in the early 2000s. I was among the first group of students to take a class on wetlands management as an undergraduate student at SUA from 2001 to 2004. At the same time, publications on wetlands management appeared for the first time in the 77th issue of the Tanzania Journal of Forestry and Nature Conservation of 2008. Publications on wetlands peaked in 2012 in which out of 18 papers published in the Tanzania Journal of Forestry and Nature Conservation, 11 were about wetlands management (SUA, 2012). Danida funding on wetlands management have since ceased, so has publications on wetlands. Academics who were

active in wetlands research, like everyone else, have turned to studying carbon and REDD+ topics attracting the most funding now.

Research on PFM appeared after, not before, donors' prioritization of participatory forestry for funding and government adoption of the same as a policy. Nothing suggests that forestry academics research on PFM preceded the choice of PFM as a policy and funding priority. Academics have mainly conducted research to make PFM even more technical. As discussed in the previous section, research on miombo woodlands, biomass and volume modelling picked up after donors expanded their scope to include forests on village land and prioritization of market – based policy such as REDD+. Again, it would be difficult to argue that forestry academics interest in REDD+ preceded, rather than followed, donors' prioritization of the same and government willingness to pilot the idea.

The pattern is such that research priorities follow foreign donor funding priorities. The corollary is what is not of interest to funders is not researched. This is probably true elsewhere and everywhere: one can only research what is funded. Forestry academics have used the funding to produce important knowledge for forest management. It further means that a forestry academic able (meaning with specialization matching the donor priorities) to carry out research on "fashionable research topics" carries the day. The more funding an academic can attract, the more powerful he/she will become. As one academic put it to me when discussing his past efforts to bring local forestry knowledge into forestry curriculum at SUA "I was powerful and influential. I headed projects with money. I was able to influence because people knew I have got resources they wanted" (Interview #35). The power and influence referred to by the respondent do not necessarily mean the same thing to scientific authority (technical capacity and social power) specified by Bourdieu (1975) as being at stake in competitions defining a scientific field. The respondent is more talking about social power i.e. ability to speak in an authorised and authoritative way based not just on scientific competence but more on the reality that one controls financial resources (even though scientific authority is correlated to the ability to attract funds).

At the same time, forestry academics who find themselves at the wrong side of the funding priorities struggle and feel marginalized. One such forestry academic admitted that he has not been able to attract funding since donors have not prioritized his area of specialization for a long time (Interview #54). He and others noted a tendency for starting academics to crossover to fashionable topics (Interviews #33 & #54; Personal communication #40). Some academics are hired to teach and research on specific forestry sub-discipline e.g. agroforestry. But because the sub-disciplines they have been recruited into are not fashionable, they opt to specialize on unrelated sub-disciplines at the master's and PhD level that are attracting donor funding. These academics

maintain positions they were originally hired for. But most of their academic activities other than teaching are related to the fashionable sub-disciplines. As a result, some areas of specialization are indeed cannibalized. Forestry academics observed that the trending topic now is measurement of trees and quantification of carbon and therefore everyone, especially early career academics, want to be involved in the topic (Interviews #33, #35 & #54). It is perhaps not surprising that a senior forestry academic who was my professor at undergraduate exclaimed with astonishment "why have you decided to study those things?" when he figured out what my PhD research was about. Since my PhD had nothing to do with GIS, forest inventory, volume and biomass modelling, I was often told that I would struggle to make money in life (Pers. Comm. #40).

To sum up section 6.2, we see that doing mostly applied research, policy recommendation research, and following donors' funding priorities in deciding research topics has consequences. Epistemological effect is the major one in which only certain questions are asked in research, producing and circulating only a certain form of knowledge. This format does not allow for questioning assumptions underlying questions asked and research undertaken. Important and interesting topics to forestry academics are those likely to be recognized by others, including funders, as important and interesting (Bourdieu, 1975). It reinforces, rather than disrupt, the taken for granted assumptions (doxa) in the forestry scientific field. The taken for granted assumptions (doxa understood as the consensus on the objects of dissensus) restricts them into asking only certain questions and not the other, consciously or unconsciously legitimizing the system of symbolic domination.[33] Questions that might disrupt the system of domination are never asked perhaps because academics are unable to realize that they are actually working to support domination. This amount to censorship as the set up does not allow for alternative forms of knowledge to emerge.

6.3 The Consultancy Culture: Forestry academics as experts

Consultancy is another activity SUA forestry academics are engaged in with the potential of cultivating and perpetuating the scientific forestry dispositions. Through consulting, SUA forestry academics are experts producing expert knowledge intended to lead to actions (Stehr & Grundmann, 2011). Unlike applied research in which the end product is a research paper meant mostly for academic minded readers, consultancy work ends in a consultancy report meant for clients looking to take some decisions. To see in what ways SUA forestry academics' expert work contribute to keeping the existing scientific order in the forest management field, we need to examine the extent to which consulting form part of forestry academics activities, the manner and type of consultancies undertaken, and the substance of the consultancy reports.

Forestry academics at SUA complete consultancies either through the College of Forestry, Wildlife, and Tourism's consulting wing FORCONSULT, Tanzania Association of Foresters, or independently. While generally information exists though not organized for consultancies completed through FORCONSULT, it was not easy to access information for consultancies completed independently. So, the discussion included here is mainly based on consultancies completed through FORCONSULT and a few completed independently.

6.3.1 Consultancy as additional income source

When I suggested during the seminar to discuss the draft of this chapter that consultancy is a survival strategy, SUA forestry academics objected. The main argument against my suggestion was that academics are salaried and that very few of them are winning consultancy opportunities. Hence, consultancy cannot be a survival strategy. It is true that academics can survive and do survive without consultancy. But then I asked the academics for how they would react if the government rolled out a new policy barring them from engaging in consultancy. One academic responded by just saying that would be a strange policy. Another responded by asking how then will the government manage to discharge its duties for all the experts are in universities working as academics? While academics argued convincingly that the government has all to lose with such a policy, they felt a sense of loss and struggled to visualize a situation in which they are not allowed to engage in consultancy. The emerging picture is one in which there can be disagreement on the relative importance of consultancy on academics' incomes. But one would be hard pressed to find an academic showing no interest in consultancy. Academics are always on the lookout for consultancy opportunities. It is true that not everyone succeeds in this undertaking. But that does not mean that academics do not see consultancy as income booster and therefore less important.

FORCONSULT, a consultancy bureau of the College of Forestry, Wildlife, and Tourism, states as one of its objectives "to improve financial earnings to staff and the Faculty as a whole".[34] Academics prioritize boosting their incomes through consultancy as much as they do through teaching. For this reason, they must juggle between teaching, research, and consultancy. Forestry academics I interviewed stated that they spend no less than 50% of their time on consultancy (Interview #45).

FORCONSULT was established in 1993 and boasts a staffing level of 80 consultants, 60% of which are PhD level scientists.[35] In other words, almost all academic staff at the college are listed as potential consultants. Since its establishment, FORCONSULT has completed over 200 consultancy assignments. The revenue generated for individual academics and the College is not

published. Further, it is safe to assume that the same forestry academics that double as FORCONSULT experts completed an equal number or more consultancies independently (outside of the FORCONSULT arrangement) since 1993. Even though it was not possible to verify this, most of the forestry academics I interviewed suggested that more consultancies are completed without than within FORCONSULT.

The point here is rather to show that SUA forestry academics do engage in consultancy and/or wish to do so for various reasons, one of them being to boost their incomes. One day in my regular conversation with a senior forestry academic at SUA, we conversed about the visibility of forestry academics. I rued about how hard it is to locate consultancy reports and resumes of forestry academics. I remarked that resumes and works completed by any academic are supposed to be somewhere online and therefore "Googleable", so much so because these academics are constantly on the lookout for research collaborations and consulting opportunities. I argued that people sitting anywhere in the world have got to be able to easily find out the profile and contacts of SUA forestry academics and that I was surprised that is not the case. My interlocutor agreed that it is important for forestry academics to make sure that they are visible and accessible as teaching alone is not enough to make the ends meet. Of the importance of having means to increase income, he said;

> "You must be able to have resources to replenish your energy. I am okay because I do a lot of consultancies. I control projects. To me, teaching is something which I can give either what I get from consultancy or research" (Interview #35).

While some may argue that this is boasting but my interlocutor appeared honest and throughout our iterative conversations, he told me things other academics couldn't or sought to frame them in a particular way.

As we will see in the next sections, consultancy as in providing professional advice is not inherently bad. But the consultancy culture can have some negative consequences. By definition, consultancy is mainly about recommending solutions within the delimitation of problem as specified by clients. As Mamdani (2011) argues when commenting on the pervasiveness of market – driven model in African universities and the consultancy culture it has nurtured, "consultants presume that research is all about finding answers to problems defined by a client. They think of research as finding answers, not as formulating a problem."[36] The consultancy culture/mentality reinforces the policy recommendation – based type of research, which is predicated on the thinking of research as finding solutions (prescriptions) and less about diagnosis (formulating problems). The "rush to solution" rather than "thinking through the problem" risks making one "look for answers outside the problem". For our case in this thesis, the ultimate effect of this is that it leaves

the underlying assumptions unquestioned, reinforcing the scientific forestry dispositions, and thus effectively perpetuating the existing scientific order in the forest management field.

6.3.2 Government as the ultimate client

Irrespective of whether consultancy is important to SUA forestry academics' income or not, the Government of Tanzania is the ultimate client of their expert advice. The Ministry of Natural Resources and Tourism and its institutions are leading the pack in the government category (SUA, 2017). The other important client is the Division of Environment in the Vice President's Office. The government pays for some assignments using its own sources. This is true even though the significant amount of consultancy is paid for by foreign donors through projects implemented by NGOs e.g. FZS's Serengeti Ecosystem Management and the government itself e.g. NFBKP and KILORWEMP. Since most of the consultancy opportunities involve building the capacity of the government in certain areas e.g. forest management, contracting often involves the government irrespective of the contracting agency and the product of academics' expert work ultimately ends up shaping the state's task of government.

It is a common practice for funding agencies such as Norad and Finnish Ministry of Foreign Affairs (MFA) to contract consulting firms from their home countries to carry out assignments in Tanzania e.g. Niras Oy, Indufor Oy, and Scanteam. SUA forestry academics have served as local counterparts/experts for these firms but still the ultimate client for these assignments is the government. A good example is the assignment to develop inventory procedures and harvesting plan using Namatunu VLFR as a case that was contracted to FORCONSULT by Indufor Oy on behalf of the government. The SUA forestry academics advises contained in their consultancy report will thus end up shaping practices and thoughts in the government's department of forestry. This is particularly powerful because oftentimes, contractors such as Indufor Oy have resources (through the projects/programs they have been hired to implement) to follow through on the implementation of the recommendations by SUA forestry academics. A case in point is the government implementation through donor-supported projects of the academics' recommendations on detailed inventories and harvest planning as contained in the report for the Namatunu assignment.

The non-governmental clients include international NGOs such as WWF and IUCN, and local NGOs such as Eastern Arc Mountains Conservation Endowment Fund. The assignments commissioned by these organizations are targeting to build the capacity of or complement the mandates of government departments and therefore involves the government in contracting. Few assignments are for their own internal uses, which do not involve a study to understand a piece of

the environment under the management of government department or to inform a policy process. Private companies are less represented in the list of forestry academics' clients.

Through consultancy opportunities, the government is often looking for expert advice on how to improve on the policy or practices already adopted or soon to be adopted. For example, the government may want to find out from an expert on "on how to carry out an inventory and prepare a subsequent harvesting plan as a pilot for one VLFR and to develop appropriate methodology for such an inventory system cum a harvesting plan which is easy to implement with relatively unexperienced survey teams and which can be carried out at reasonable costs" (Indufor, 2014, p. 2). Thus, consultancy is not an avenue to criticize but rather to deliver what the client asked. The terms of reference are usually specific, rendering consultancy less effective in the academic task of critical analysis of policy and thus a tool for polishing the already agreed (or soon to be agreed) policy and practices. The job of a consultant then becomes to add building blocks to the already agreed design of a structure and not to rethink about the design itself unless the client so wishes. If the consultant agrees to supply building blocks, that also serve as an approval by expert of the design (Stehr & Grundmann, 2011).

6.3.3 Consultancy as Production of Certainty (and Uncertainty) in decision making

Through consultancy, forestry academics provide certainty to bureaucrats. Stehr and Grundmann (2011, p. 43), argues that "expertise reduces the complexity, and by doing so creates certainty in decision – making. Experts must attempt to keep their knowledge in short supply, and to promise their clients convincingly that their judgment occupies a privileged position". Forestry academics from SUA command a high scientific authority in the forest management field. This makes their advice to be seen as occupying a privileged position. Forest bureaucrats often see academics' advice as credible, which is based on trust in forestry academics' scientific authority.

In Rufiji District, the last district – wide inventory was conducted in 2005. This inventory was part of the "reconnaissance forest inventory" commissioned by FBD and completed by a SUA forestry academic. The aim of reconnaissance forest inventory is not to inform harvesting decisions, at least judging from the requirement of detailed inventory for harvesting in VLFRs. Yet, harvesting on general land in Rufiji was still based on the inventory in 2005. The district forest officer admits that the 2005 inventory may not reflect the reality in the forest today much as it did when it was prepared (Interview #51). But in the absence of updated inventory, the forest officer thinks it is safer to rely on the 2005 inventory than otherwise.

The 2005 inventory was not sufficiently detailed to inform harvesting decision. Further, because

the inventory was just a reconnaissance, relying on it could overestimate harvesting levels. The forest officer agrees and argue that "*the 2005 inventory was completed by SUA experts. We do not think that they made mistakes. They must have got their calculations right* (Interview #51)". Because the inventory was completed by SUA forestry academics, the forest officer feels somewhat certain to base harvesting decisions (these decisions become defensible). Even though the forest officer had reservations and suspected that there is a possibility that the 2005 inventory might not produce intended results, he somehow found some assurance from the fact that the inventory was completed by SUA forestry academics. This suggest that it is not so much about forest inventories and knowing what is in the forest than authoritative support for harvesting decisions (Stehr & Grundmann, 2011). The forest officer knows that it is unprofessional and that he will be criticized for allowing harvesting without inventories and plans. He/she also knows that it is impractical to measure the trees on general land. Now because inventories and plans are expected, the priority then shift to defending harvesting decisions than to actually have inventories and plans that reflect realities. This reflects practical expediency more than a lack of faith in technical planning and scientific forestry principles.

In the Namatunu assignment (detailed inventory and harvest planning), SUA forestry academics proposed a blocking system for the miombo woodlands (FORCONSULT, 2015). Specifically, the team divided the forest (8,566 ha) into five blocks, which gives 25 years' rotation (**Error! Reference source not found.**). Each block represents a five-year management plan and for the first five years, only block #1 would be harvested in which trees above the legal minimum diameter for harvesting (>45 cm) are progressively targeted. For mninga (*Pterocarpus angolensis*), the plan recommended a sustainable harvesting level of 127 trees (230 m^3) per year in block 1.

Table 5: Management blocks for Namatunu VLFRs

Block	Area (ha)	Annual harvesting levels
1	1,680	847 trees, 2,019.36 m^3*
2	1,590	
3	1,745	
4	1,452	
5	2,099	
Total	**8,567**	

*The Swahili version of the plan shared with local communities shows 763 trees, and 1,819 m^3.

One of the international technical advisers involved in the contracting of the Namatunu assignment maintains that development of methodology for this assignment was completed together with the SUA forestry academics, the consultant (Interview #42). The intricacies of what that entailed

(methods) were hammered out together with the forestry academics selected to undertake the assignment. Forestry academics thus influenced the selection of a blocking system as a method for achieving sustainable forest management. The blocking system was accepted because it resonated with the clients and technical advisers' idea of sustainable forest management. So, in this case, SUA forestry academics provided certainty not only through firm recommendations but also in the methodology itself. In-depth interviews with the technical adviser and forestry academics involved in the assignments confirmed that blocking system is regarded as the only way to guarantee sustainable management of miombo woodlands (Interviews #37, #42, #66). They asked, at different occasions, "*if you don't adopt a blocking system, what will be the basis for sustainability?"* One of the international technical advisers described anyone suggesting that blocking system might not work for miombo woodlands without proposing an alternative for achieving sustainable forest management or who propose deregulation of local communities' interactions with forests as '*anguish of the liberal mind*' (Interview #66).

The Namatunu plan and the blocking system produced certainty at least on paper – it provided credible numbers on which to base harvesting decisions to achieve sustainability. The plan, however, did not survive the test of realities. The proposed 127 trees of mninga species that could be harvested in block 1 per year in the first five years were not found during the actual harvesting, even after repeated search. Proposing the blocking system for chaotic miombo woodlands produced 'organized chaos'. The system introduced some order in the form of a harvesting plan, but the chaos prevailed. Miombo woodlands, unlike planted forests of exotic species, are uneven-aged and uneven-sized stands of different species. Further, it is not unusual for species and/or trees of harvestable size to be non-uniformly distributed in an area. Applying a blocking system to such a forest means mature trees in the fifth block will wait for no less than 20 years to be harvested, assuming each block represent 5-year management plan. Twenty years is a long time for a mature miombo species and a lot can go wrong – it can be stolen, consumed by wildfires, or eaten by bugs and thus compromise its timber worthiness. When asked about these complexities and what they mean to the blocking system, a forestry academics involved in the Namatunu assignment remarked; "That is a challenge!" (Interview #37). Yet, he struggled to see a way out of it, asking, "what will be the alternative? Because the idea is to systematize and bring order to the administration of harvesting, without which time will come when there will be nothing in the forest to harvest" (Interview #37; similar arguments in Interview #53). Another forestry academic admitted to the limitations but then argued that they are required to recommended something and there should be a starting point. That inaction is not an option.

While forestry academics are perhaps aware of the limitations of their knowledge, they hesitate to approve the MCDI approach presented to them as an alternative to blocking system. In Angai village land forest reserve, MCDI was hired after management plans prepared by SUA academics were rejected. Asked about this move, a forestry academic who approved of the rejection of Angai management plans prepared by his colleagues said:

> "They hired MCDI so that they can apply their rapid method to determine harvesting levels. But their transect method……. you know in miombo you can find a hill somewhere and if you go to the valley (bondeni), that is where you find many trees. Transect method is biased in that way…that it avoids places/pockets with no trees. Transects only follow big trees. My worry is they will succeed in identifying and harvesting big trees. But once big trees are finished, do not expect that they will find trees in places where transects didn't pass. Imagine, you layout transects knowing that in this particular direction you will find trees of harvestable size. And I don't even know how they determine tree sizes. Do they adhere to the legal minimum diameter for harvesting? How do they do it? It is not clear to me how they do it" (Interview #53).

Forestry academics agree to the minimum legal diameter for harvesting of 45 cm for most species in the miombo woodlands as an instrument of sustainability. Local communities with their local knowledge know that it is possible to have a very old tree nearing the decaying phase but with diameter below 45 cm. And thus, relying on the diameter as the only basis for deciding trees to harvest run the risk of wasting mature trees of the size below legal minimum diameter. While forestry academics understand the local communities' argument, they argue that the minimum diameter of 45 cm is a legal requirement and thus they couldn't change it. When pressed that it perhaps became a legal requirement after the forestry academic advice, a forestry academic responded "well, I think it was determined based on experience" (Interview #37). Another forestry academics responded;

> "These trees have been there for over a century. They have been there for many years. Chances of finding a rotten standing tree, mninga, we have never seen anything like that. If you temper with the size (legal minimum diameter of 45 cm), they will keep on reducing it. Because now there are trees with minimum diameter of 45 cm in the forest, harvest those first. Once they have finished, you can then bring up an argument for it to be lowered. But if you entertain this argument from the start, we will not get anywhere" (Interview #53).

This quote illustrates there is a recognition of the limitations of technical forestry approaches and that it is to some degrees a work of trial and error. Yet, SUA forestry academics insist on technical forestry approaches even with the recognition that these approaches may not be suitable to the management of miombo woodlands. In Namatunu village, local communities reported finding rotten trees (heart rot) not suitable for timber (Interview #41). At the workshop on the 10 July 2017 in Morogoro to discuss inventories and harvesting plans prepared by district forest officers for the seven VLFRs in the three-district funded by Belgian Technical Corporation, it was reported that

in Mtanza-Msona village, a timber buyer declined to harvest *Afzelia quanzensis* (Mkongo) and *Julbernardia globiflora* (Mtondoro) species licensed to him because trees were found to be of low timber quality – rotten and sapwood (Participant observation #94; Pers. Comm.).

There is also a question of growth rate. Forestry academics and their clients admit that growth rate for miombo species is an elusive variable reflecting the vicissitudes of nature. A lot of things can influence growth rate of a tree to the extent that trying to establish a single number is to engage in a Sisyphean task. Yet, even with this knowledge, forestry academics are willing to pick up a number and work with it while still claiming that their estimates guarantees sustainability. A forestry academics defended this practice by saying:

> **"**You know exactly that this thing has got the limitations so and so and so. But at the end of the day, you are required to suggest a solution. So, you search in many different sources for information on growth rates until when you arrive at some number. When you arrive at a number, it means that you have already factored in your doubts by reducing the growth rates to the minimum possible. The growth rate we used in our calculations is very small compared to what the literature says. So, the key is to pick a very small figure such that when you plug it in the calculations you will not run into troubles (Interview #53)".

Again, this quote illustrates the recognition of the limitations of scientific forestry approaches in the management of miombo woodlands and the unwillingness of forestry academics to rethink the model. In the Namatunu case, forestry academics produced uncertainties to the extent that local communities backed by their technical facilitators decided not to apply the academic harvesting plan. Another good example of forestry academics creating more uncertainties is the Angai VLFR in Liwale district. Namatunu is not a unique case of SUA forestry academics producing uncertainties. The famous Angai VLFRs is another good example. Around 2007 and 2008, forestry academics from SUA were engaged to complete the inventory and management planning of the ~140,000-ha forest, falling in 13 villages then (now 24 villages) at a cost of USD 100,000 only for the inventory to be ruled spurious and dubious (Pers. Comm. #43). The other example is the idea of sustainable charcoal production piloted in Kilosa district in which some academics are accused of causing uncertainty by approving practices that other academics and foresters consider as threats to the sustainable forest management (Field notes #96).

Even though SUA forestry academics produce uncertainty stemming from the limitations of technical forestry approaches in the management of miombo, they are still very much relied upon by bureaucrats and practitioners to produce certainty. Since bureaucrats and practitioners expect academics to produce scientific recommendations e.g. the Namatunu case, SUA forestry academics do just that even with the recognition of limitations of doing so. Academics refrain from emphasizing on the limitations of their proposed forest management solutions because doing so

would amount to failing to "promise their clients convincingly that their judgement occupies a privileged position" (Stehr & Grundmann, 2011, p. 43). Further, telling clients that less scientific forestry approaches are probably more relevant to the task of managing miombo woodlands may dilute the *legitimacy* sought after by the clients. Admitting to the limitations of the scientific forestry knowledge to the task of managing miombo woodlands and yet go on to draw on it to recommend scientific approaches suggest self–seeking behaviour. But it does also point to the strongly held (habitus) and therefore taken for granted (doxa) tradition in the scientific forestry field of favouring scientific forestry approaches. Either way, SUA forestry academics are relied upon to provide certainty and authoritative support in decision making and create legitimacy and in so doing, we know that they are more likely to emphasize on scientific approaches, partly to preserve their scientific authority (Bourdieu, 1975). We also see that in their efforts to produce certainty, SUA forestry academics engage in acts of valorising scientific forestry knowledge by suppressing competing forms of knowledge e.g. when academics refused to learn from and approve the MCDI approach. In the competition for scientific authority, the key is to impose a definition of science that valorise the knowledge you possess and, in a way, suiting your interests (Bourdieu, 1975; Lave, 2012a). The ultimate effect is the keeping of the dominant scientific order in the forest management field by making it impossible to achieve a radical change of the scientific forestry habitus.

6.4 Recruitment of new academics as reproduction of the producers (and reproducers) of scientific forestry

It is unwritten rule and expected that each forestry academic edging towards retirement try and recruit a successor. It is thus not unusual to come across forestry academics at SUA in a casual chitchat taking tally of who recruited who as their successors. Usually, these conversations are aimed at vilifying those who are on their way out and yet to recruit successors. The academics with no known successors are condemned for their selfishness - more willing to leave behind vacancies than recruit successors. Senior academics with known successors are complimented for their contribution to the continuity of scientific forestry. The successors (newcomers) are usually fresh graduates with good grades and who have demonstrated interest and willingness to learn and reproduce the knowledge, including worldviews, and skills of their recruiters (their professors). In other words, the successors are often not rebellious young scholars willing to take risks and challenge their recruiters – usually senior forestry academics commanding higher scientific authority.

Through research assistantships, recruiting forestry academics encourage newcomers to specialize in the same disciplines as themselves while discrediting competing areas of specialization. For instance, a forestry academic specializing in forest mensuration will be telling potential successor(s) that forest engineering is a dormant sub-discipline that should be avoided lest you struggle to grow in the career and make a living. When it's time for the new entrant into the field to get master's and PhD degrees, their recruiters often serve on the supervision teams. They also co-author papers, co-teach classes and jointly apply for and execute consultancies together. In this way, forestry academics ensure that they are only recruiting new academics who have demonstrated willingness to think and act like them. But even with that, one must first demonstrate willingness to think and act like the senior forestry academics hiring him or her. It follows that young scholars with radical ideas and ways of doing things are unlikely to penetrate and grow within the forestry scientific field.

Since they want to be accepted and become authority in their chosen sub-disciplines, new entrants strive, consciously or unconsciously, to learn and perpetuate the knowledge and style of their recruiters. They are usually "faithful to the principles of official knowledge" (Bourdieu, 1975) - recruits are keen to maintain and reproduce not only existing dominant form of knowledge but also 'principles legitimating domination'. They show high level of academic respect to their recruiters, which takes the form of avoiding, as much as possible, to challenge senior forestry academics (who holds the monopoly of scientific legitimacy) and their authorized knowledge. This is further enforced by the hierarchical structure of the field and the hierarchical thinking it has nurtured. I attended not less that 10 PhD seminars at SUA, including my own presentations, and usually academics are patronizing based on seniority. For example, when senior professors dislike something in student's work, other academics in the room usually follow suit. I did not witness any situation in which a junior academic disagreed with a senior academic. Patronizing is more prevalent in the way academics supervise and comment on students' work. Usually, supervision takes the form of an academic imposing his or her worldviews and approaches to research, including methods. There is also a great deal of emphasis on template and conventional ways of doing things. This leaves little room for students to innovate, experiment, and fail. Supervision is hardly about guiding students to implement their innovations in their own creative ways. It is more about ensuring that students conform to the established scientific order. This is censorship guised as a legitimate act of supervising students.

In this way, a new entrant is approved as being good based on the extent to which he or she can reproduce the authorized form of knowledge – scientific forestry. This represents a form of censorship in which what is censored is opposing knowledge and ways of knowing. As Ai Weiwei

(2017) writes about *How Censorship Works*, it "impoverishes intellectual life" and for it to work the censored must subscribe to "self-censorship".[37] In the scientific field, self-censorship is arguably sub-conscious because members to the field are often not even aware that censorship is taking place. It's hard to come across any new entrant into the forestry academic field trying to challenge the established scientific forestry and/or the principles of its legitimation.

In the language of Pierre Bourdieu, new entrants to the forestry scientific field in Tanzania pursue "the risk-free investments of *succession strategies*, which are guaranteed to bring them, at the end of a predictable career, the profits awaiting those who realize the official ideal of scientific excellence through limited innovations within authorized limits" (Bourdieu, 1975:30, *emphasis in original*). The goal of new entrants is to *succeed* senior forestry academics and continue with the same things in the same manner and style. The goal is not to *replace* senior forestry academics and introduce radically new ways of thinking and doing forestry. Pursuing the latter (*subversion strategies*) is risky, not only because it lowers the chances of entering the field in the first place but also for lowering the odds of making it to the top if one succeeds to enter the field (the opportunity cost is the profit that comes with adopting the succession strategies). It is common to come across new entrants into the forestry academic field complaining about their senior counterparts. The new entrants even complain about the traditional thinking of the so called "academics with classical forestry" thinking. On the face value, it is tempting to think that new entrants despise the thinking and approaches of older forest academics. But if you listen carefully, these complaints do not mean that new entrants are challenging the core of scientific forestry knowledge or the way it is generated. Often, the complaints are about positions, money, and personalities. The complaints are often about failure by senior forestry academics to pay newcomers for fieldwork they undertook on their behalf, for instance.

6.5 Consultancy influence teaching in classrooms

Consulting informs teaching by generating real world examples and experiences. These are then brought back into classrooms to support textbook materials. When students questioned the scientific basis of adjusting the allowable error depending on the resources available for inventory during the forest resource assessment field course, the professor was quick to tap into numerous consultancies he has been involved in to assure students that this is how it is done in practice. He assured students that if they do the same, their work would still be accepted as scientific (Field notes #16 – #25). In that course, data collection forms and analysis templates shared with students were similar to those used by academics in the Namatunu assignment and in a short course for district forest officers. The only exception is TROFIDA – the data analysis package for inventory

data collected from tropical forests. When pressed for not teaching TROFIDA to undergraduate forestry students, a forestry academic argued "TROFIDA is too automated. We normally don't expose students to it because they will be lazy. They won't pick up the basics" (Field notes #55 – #59).

In a forest management planning class, a professor is keen to ensure that students do not confuse the interpretation of density expressed as cubic meter per hectare with the actual volume that can be found in a hectare (Field notes #60 – 65). Using the Namatunu case, he warns students that some people have just failed to interpret density results by thinking that in every hectare, they will find the reported number of trees/volumes. That a density of 2 m^3/ha does not mean that one will find two cubic meters in every hectare. This is just an estimation and as any other estimates, it must be read together with associated probabilities (standard deviation), something the people of Namatunu failed to understand. The blocking system applied in Namatunu, taught in the short course of district forest officers, and recently applied in several village land forest reserves in Kigoma has also been brought into the classroom at SUA. Here is the excerpt from the notes on yield regulation and forecast:

> "Yield by area basis is useful in irregular tropical forests. The forest is divided into *n* blocks. Each block visited once every n^{th} year. During that year all activities from tending to felling are confined in the block. The longer the cycle, the smaller the coupe and vice versa. For example, for 500 ha forest with long cycle of 20 yrs the annual coupe will be 25 ha. With shorter cycle of 5 yrs the coupe will be 100 ha." The notes continue;
>
> "It is hardly practical to distinguish management of yearly age classes in the felling series. In our 600 ha forest it may be practical to group the forest into four 5 yr classes of 150 ha each called periodic blocks. During 5-year period 150 ha are felled of age class 16-20 yrs. Similarly thinning is carried out on periodic block basis rather than single age. Periodic blocks are more flexible to accommodate fluctuations in yields and markets. The choice of the length of felling series depends mainly on time required to permit regeneration. Therefore, the number of blocks, N = R/r, where r = regeneration period. In our example, the forest is divided in N blocks of length r years and average annual coupe C ha/yr. Thus N*r*C = A ha (Total forest area)" (Class notes, #46).

The origin of the blocking system is plantation forestry, which forms the basis of what students are taught at SUA. Management of natural forests taught in class is an extrapolation of what happens with the management of plantation forests (exotic species) with some adjustments such as switching from working with age class to diameter class and silvicultural practices take the form of restricted access to natural forests. The blocking system survives, no matter what type of forests.

6.6 Forestry academics as bureaucrats

The distinction between forestry academics and bureaucrats is blurred yet again by the practice to appoint the former into occupying positions in government departments. **Error! Reference source not found.** below indicates some of the academics appointed to occupy positions in the Ministry of Natural Resources and Tourism at different times. In Tanzania, the practice of appointing academics to occupy positions in the state bureaucracy is not confined to the forestry and natural resources sector only. It is probably more prevalent in other sectors. While this practice is not new, it has gathered pace under the fifth-term government, which came to power towards the end of 2015. More and more academics are being appointed to occupy positions in the government, mostly as head of parastatals and departments, and members to the board of parastatals. By appointing academics, the appointing authority appears to assume that academics, being the top experts in their fields, are highly qualified individuals for government jobs. Indeed, appointed academics go on to strengthen government operations and many yet to be appointed academics show interest in helping the President deliver on his mandate of leading the country to development. Our purpose here is not to judge whether the practice of appointing academics is good or bad. Rather to point out on its effect in perpetuating the established scientific order privileging scientific forestry knowledge.

Table 6: The list of forestry academics cum bureaucrats

S/N	Forestry Academic	Position	When
1.	Prof. S. Iddi	Director, Forest Division	1996 - 2007
2.	Prof. R. Malimbwi	Full-time Consultant, NAFORMA	2009 - 2012
3.	Prof. E. Zahabu	Full-time Consultant, NAFORMA	2009 - 2012
4.	Prof. A. Songorwa	Director, Wildlife Division	2012 – 2014 & 2016 – To date
5.	Prof. J. Kideghesho	Asst. Director, Wildlife Division	2012 - 2014
6.	Prof. Yonika Ngaga	Member, Tanzania Forest Service Board	2014 – To date
7.	Dr. Ezekiel Mwakalukwa	Director, Forest Division	2016 – To date
8.	Prof. Dos Santos Silayo	CEO, Tanzania Forest Service	2016 – To date
9.	Prof. Jumanne Maghembe	Minister, Ministry of Natural Resources and Tourism	2006 – 2008 & 2016 – 2017

When an academic is appointed to a government position, he or she is practically not available for teaching. The appointed academics effectively switch from the production to the application of knowledge. But often the move to the government is temporary. Most of the appointed academics return or at least expect to return to academia at some point in the future. Thus, they rarely quit their positions in academia. Also, they maintain professional contacts with colleagues in academia. In other words, academics appointed to the government positions are unlikely to lose their academic touch and usually continue to tap from the same academic pool as they produce practices

in their new positions. Joining the forestry bureaucracy offers yet another opportunity for academics to promote and stabilize the scientific forestry knowledge forming the basis of their authority, the very authority that made them appointed to the government positions in the first place. Having an academic at the top of the forestry bureaucracy echelon makes it even harder for competing forms of knowledge to his/hers to emerge because the bureaucracy is likely to ramp up the demand for the knowledge authorized by the academics. For example, in the sustainable charcoal debate opposed by Tanzania Forest Service (TFS), the service shortlisted an academic to buttress the argument against charcoaling (Participants observation #96).

This way, forestry academics continue to influence the application of scientific forestry by being part of the state. This enables forestry science to serve its original purpose for it was invented as cameral science i.e. a science closely aligned to the interest of the state (Lowood, 1990). The first "calculating foresters", as is arguably the case with "calculating foresters" of today, sought to enable the fiscal function of the state: they "quantified in spirit in order to bring profits in practice" (Lowood, 1990).

Appointing academics into government positions has other consequences for the production and reproduction of the scientific forestry habitus. The practice implies that academics consider themselves potential candidates for positions within the state bureaucracy. The implication is that consultancies and research completed by forestry academics are rarely critical of government policies and practices. Forestry academics' research and consultancies are reduced to seeking to provide recommendations on how policies and practices can be improved, assuming that premises are faultless. Intuitively, it is perfectly plausible. If you are lining up yourself for appointment into the government position, you are not going to produce writings criticizing the government or sound disapproving of the government conducts. In the end, academics produce knowledge that the state bureaucracy wants or finds palatable given the social, political, and economic context of the day. Put it differently, forestry academics resort to producing scientific forestry knowledge and provide advices based on that knowledge as long as it appeals to the state bureaucracy. In this setting, pursuing subversive strategies is risky as it compromises appointments and consultancy opportunities.

6.7 Absence of Competitors

Absence of competitors producing an alternative form of forestry knowledge to that of forestry academics reinforces the existing scientific order. It gives the academics the monopoly to the scientific authority and make it easier for them to legitimately impose the official truth (Bourdieu,

1975). A local NGO, Mpingo Conservation and Development Initiative (MCDI), attempted to produce an alternative inventory method to that of forestry academics. The NGO operates mainly in south-eastern Tanzania and its purpose is "to develop PFM with a particular focus on sustainable exploitation of the valuable hardwoods to be found in the forests there" (Ball, 2009:28) . As its name suggest, the NGO's original purpose was to promote sustainable exploitation of mpingo (African blackwood, *Dalbergia melanoxylon*) but it has since expanded its geographical scope and focus to the miombo woodlands in southern Tanzania. In its early years, the NGO observed that despite the increasing coverage of participatory forest management schemes in Tanzania (380 village land forest reserves by 2006), these communities were not receiving any revenue from timber harvesting. Complexities of determining sustainable levels of harvesting for natural forests, low educational level in rural areas, inadequate knowledge of natural forests, and the conservation stance enshrined in the participatory forest resource assessment guidelines were pointed out as the reasons:

> "One of the reasons for this lack of exploitation has been the lack of technical understanding of natural forest processes and management within Tanzania; university courses and technical training focus mostly on plantation management with only general guidance given with regards to management of natural forest. Guidelines developed by the Forestry and Beekeeping Division for Participatory Forest Resources Assessment (PFRA) (MNRT, 2005) are more appropriate for assessing NTFPs (non-timber forest products) such as firewood than timber resources, and when field tested (…) did not yield sufficient data for the accurate determination of appropriate harvesting quotas" (Ball, 2009: 28).

Practitioners at MCDI, led by expatriate adviser, thought there was a high demand for practical knowledge on the sustainable management of natural forests. Thus, they sought to develop an innovative, "simple quota determination system, which can be used by communities without outside assistance" (Ball, 2009:27) while at the same time ensuring that it achieves "ecologically sustainable cut in natural forest that is subject to minimal management or silvicultural intervention" (Ball, 2009: 28). The MCDI goal was to simplify data collection and analysis and reduce cost, while at the same time produce decent estimates for harvesting levels. MCDI sought to improve on and/or replace the government issued participatory forest resource assessment guidelines (PFRA). Ball (2011) argues that "more appropriate for assessing NTFPs such as firewood than timber resources and when field tested did not yield sufficient data for the accurate determination of appropriate harvesting quota". The philosophy underlying PFRA was simplicity to ensure communities participation in resource assessment (Interview #81). It thus relied on forest walk and visual assessment of the forests. The latest version of PFRA employ transect method and specify sampling intensity of 0.8 % for a forest bigger than 300 ha or a maximum of 60 plots (URT, 2007).

Unlike the fixed sampling intensity of participatory forest resource assessment guidelines, the MCDI approach uses transect method and only seeks to record a minimum of 50 trees for each species of interest and a minimum of 20 trees for species of lesser interest. So, the number of transects cannot be determined in advance. In practice, MCDI are now covering the entire VLFR area. Transects are 10-meter-wide and the only variable measured is circumference at breast height. Unlike the systematic cluster plot sampling method of forestry academics, the MCDI approach involves no sample plots or clustering. Strictly speaking, the transects can be thought of as long, narrow plots in which plot area is the transect width times its length. Analysis start with assigning measured trees into three colour-coded size classes based on legal minimum diameter for harvesting: not yet harvestable (red), harvestable (green), and extra-large trees (Blue). Then, the number of measured trees in green and blue classes for each species are used to read the sustainable harvesting quota from a reference table. Reference tables have all the statistics and calculations embedded in it based on the 75% lower confidence level.

Although MCDI approach is simpler, it does not represent a major departure from the scientific approach of the forestry academics. The SUA forestry academics method employs a circular cluster sampling and the amount of error an analyst and forest manager are willing to allow determines the sampling intensity (FORCONSULT, 2015). The MCDI and SUA approaches make similar assumptions e.g. trees will grow at a certain growth rate to replace those taken out. The only major difference is on the level of efforts each method allows, which mainly depends on the level of statistical accuracy one is prepared to achieve. MCDI approach is keen to collect only enough information whose return would justify investment. The forestry academics' approach pays little attention to the cost and benefits of collecting information. Ideally, in PFM context, the value of the collected information must exceed the cost of collecting it.

The early champion of the MCDI method was an expatriate and thus he was not trained at SUA. He attended the First Participatory Forestry Management (PFM) Research Workshop held in Morogoro in June 2009 where he presented a paper on the MCDI method. One hundred and four people attended the workshop, of which at least 15 were forestry academics. He tried to "sell" the MCDI approach in which he concluded that the sample plot versus transects approach debate is;

> "symptomatic of another major weakness of PFM, that it is often pushed by local development or conservation agencies with little thought to local goals; if you do not know why you are conserving some forest, then you will not know what to assess. PFM facilitators should instead agree on clear goals of PFM with participating communities, and only assess forest resources relevant to those goals" (Ball, 2009: 34).

Ball (2009) further made a case that adopting transect method he and his team devised would mean "putting forestry back into PFM" (meaning it is step ahead of simplistic PFRA) (34). He has since

left the organization. The current director of MCDI, Mr. Japer Makala, studied forestry at SUA. While he has continued the MCDI approach and talking about it in different fora, his approach is less combative. Mr. Makala avoids to directly challenge the works of forestry academics in a manner that valorises its approach. Perhaps because MCDI has managed to find a market niche and its ambition is not to expand and cover the entire country. Kilwa district is MCDI stronghold. In fact, MCDI enjoys a monopoly of facilitating PFM activities in the district. MCDI approach, which also include FSC certification, enjoys considerable donor support, especially the Finish government and WWF. When the management plans written by forestry academics through Finish funding failed, MCDI was hired to rescue the situation in Namatunu and Angai (Interview #47). While the current MCDI director discussed about the shortcomings of the forestry academics' in Namatunu and Angai, he did so carefully without categorically criticizing the forestry academics behind those plans.

MCDI receives grants from WWF for PFM activities in WWF's priority areas of coastal forests and the wildlife corridor in southern Tanzania linking Selous (Uwezo Tanzania) and Niassa (Mozambique) game reserves. WWF has supported MCDI activities in Kilwa district for many years now. When WWF sought to expand PFM activities into Tunduru and Namtumbo with the view of securing the wildlife corridor linking the two reserves, MCDI had to expand its coverage to the new districts. WWF initiatives such as Investing in Locally Controlled Forestry prioritize MCDI as a credible local partner. WWF through its network has sought to increase MCDI global recognition, including linking it to international timber buyers such as the British firm Sound & Fair.[38] Even with all this attention, MCDI is not presenting itself as an alternative to forestry academics. Neither do MCDI think of forestry academics as their competitors. That is the case even when donors tried to elevate MCDI approach over that of the forestry academics. A former senior officer at the Finish embassy in Dar es Salaam commented on the situation as follows:

> "MCDI is good. But it is an NGO, completely dependent on donor funding. They are not business, start-up like, which would have been better for village land forest reserves. The SUA professors are aging and have lost the innovative edge needed to keep pace with changing times. It is going to require young, clever, and innovative foresters and who are less rigid to set up start-up companies to provide forestry services to village land forest reserves" (Pers. Comm. #43).

Opportunities for MCDI to discredit inventory and harvest planning method of forestry academics present themselves occasionally. But MCDI have refused to take that route. Based on my interviews, it appears that the reluctance of MCDI to take on forestry academics is based on the principle of camaraderie. The director and other foresters at MCDI have a lot of respect for forestry academics, their former professors. Thus, MCDI team appears to think that their scientific authority cannot match that of their professors. Further, MCDI knows that their inventory

procedure does not have widespread approval of forestry academics for being statistically weaker. Thus, MCDI has chosen not to lock horns with forestry academics and instead focus on controlling its already secured turf. This does not mean that MCDI is completely oblivious of the politics of the inventory methods, as exemplified in this response by an MCDI team member when he was pressed to comment on the critique that MCDI inventory method goes after big trees only:

> "The key point here is there are number of methods available in this country for doing inventory but each with strengths and weaknesses. People who say that our methodology goes after big trees only are wrong. One should read our Participatory Timber Inventory Guidelines to understand this. Our methodology is focused on timber and critics have been saying this is narrow. Yes, I agree, but that is the objective of most inventories in VLFRs - to assess timber trees rather than the all resources in the VLFRs. Our methodology generates reliable resource (timber) information and is fairly easy to understand and cost effective. On other inventory methods, I can say they are Ok depending on what the objectives of the inventory are. But they are too costly. This does not mean the MCDI one is 100% perfect, it can further be improved (Pers. Comm. #69).

There are no private firms owned by non-academics in Tanzania providing forestry services: forest inventory, forest management planning, and delivering short courses in forestry. If one considers the potential PFM coverage in the country, let alone other demands from forest department and private owners of forests, the available forestry academics cannot sufficiently manage to assess all the forests in the country. Further, it is expensive to hire the few forestry academics available. But there are ways to reduce costs as suggested by an international technical adviser for a donor funded project (Interview #66). He thinks that the same plans with reasonable standards can be done by DFOs. This, however, require capacitating DFOs to conduct inventory, analyse data, and draw up plans. He argues that the cost will be much lower the moment DFOs reach the stage of drawing up plans of the same quality as that of forestry academics.

The adviser rues the absence of forestry service providers to properly roll out the academic version of forestry and bring the cost down. But the absence of private forestry companies in Tanzania have much more serious effects than keeping the cost of inventory and management planning high. It also means forestry academics and their model face less competition. Alternatives to existing scientific forestry knowledge are thus less likely to emerge. According to Lave (2012), the absence of competition/diversity in views is a perfect condition for producing and reproducing habitus for the field.

6.7 Conclusion

In this chapter, I have shown that the scientific forestry field, as dominated by SUA forestry academics, play a crucial role in perpetuating the existing scientific order – the one that favours the scientific forestry knowledge. The manner in which forestry academics conduct forestry

research and consultancy, recruitment of new entrants as well as the absence of competition amount to censorship of competing forms of knowledge and ideas. Further, the analysis presented here makes it clear that activities of forestry academics do not proceed in isolation to the way the product of their work will be applied. The overall set up means that forestry academics do not engage in any activity with the potential of radically change the forest management field in the way of eroding the scientific forestry habitus.

The next chapter examines practices in the forest bureaucracy with the aim of revealing how these practices are shaped by dispositions inculcated and acquired in forestry schools and carefully reproduced by forestry academics. The chapter also seeks to reveal the taken-for-granted assumptions (doxa) legitimizing technical practices while discouraging diversity in the production and circulation of forestry scientific knowledge.

Chapter 7: Taking it for granted: technical practices in the forest management field

"*It ain't what people know that causes trouble, it's what they know that's ain't so*"
- *Unknown*

7.1 Introduction

When I spent time in the natural resource office of Rufiji District Council, stories about Ngumburuni forest came up regularly. Ngumburuni forest covers some 10,000 sq. km. of which between 3,000 to 4,000 is a local government forest reserve officially under the management of Rufiji District Council. The forest reserve was already declared by German colonial authority before World War I for its richness in valuable species such as *Milicia excelsa* (Mvule), *Dalbergia melanoxylon* (Mpingo), *Pterocarpus angolensis* (Mninga), and *Khaya anthotheca* (Mkangazi) (Durand, 2003). Officials cannot hide their disappointments about the current state of Ngumburuni forest. All commercial species are all but gone, thanks to sustained over-harvesting of timber and charcoal. Human activities-borne threats to the rich biodiversity that once was the key feature of this coastal forest are at alarming level. Officials admit that for many years the forest reserve only existed on paper due to inadequate human and financial resources to enforce the rules. Illegal harvesting and agriculture replaced the technical management of the forest.

In efforts to correct these shortcomings and arrest the disappearance of Ngumburuni forests, some donors stepped in, mostly under the auspices of the Rufiji Environmental Management Program (REMP). International Technical Advisers (ITAs) for REMP working with the Rufiji district council drew up a Forest Action Plan. Under the plan, the District Council approved the transfer of the Ngumburuni forest to adjacent communities (six villages depending on this forest as a source of livelihoods). To improve forest management, the plan identified preparation of forest management plan for the forest as a priority. In other words, officials and technical advisers reasoned that the only way to rescue Ngumburuni was to reinstate technical management of the forest. Forest inventory was carried out with emphasis on rescuing the rich coastal forest, delineating ecological areas, identifying priority areas for conservation and planning for timber harvesting (Durand, 2003).

All these activities took place the years leading to 2003. Today, Ngumburuni forest is still without a management plan as is the case for 18 other forest reserves in Rufiji district (Interview #51). Further, the transfer of Ngumburuni to communities never happened. The 16 national forest reserves in the district are now under the management of TFS. The district is still seriously underfunded and understaffed. Three forest officers in the district natural resources office handle

over 206,000 ha of forest (Interview #51). Notwithstanding, the call for forest inventories and technical management plans is even louder today while harvesting is taking place without plans in some areas. The Rufiji DFO argues "we must prepare management plans even if there are no people to implement them. At some point, we will be able to effectively implement approved plans. Having no capacity to implement technical plans is not a sufficient reason to declare forest management plans as useless. After all, the law requires us to prepare management plans. We must do so. We don't have any other choice (Interview #51)."

Officials at the headquarters of the forest department in Dar es Salaam echo these narratives. Forests countrywide are disappearing, they argue, because for a long time, inadequate funding and staffing led to weak management. The solution to the problem of disappearing forests is thus technical. That is the case even where foresters realize that it is impractical to inventory and draw up technical plans for all forests. Or that implementation of the plans is unlikely.

This chapter explores these contradictions i.e. the propensity for technical approaches even when that amount to nothing in practice. The chapter examines irrationalities in the practices of state foresters. Irrationality here means practices that contradict the intended results or that appear unlikely to be implementable. Despite the contradictions and disjuncture, the appearance of coherence and order is achieved in the sense that nobody questions the emphasis on technical approaches. Effective implementation of the technical approaches is so far elusive, yet the representations of crisis in scientific forestry knowledge are rarely observed, which resonates with Mathews (2005) argument that state power also depend on official ignorance.

The chapter argues that accounts of greedy professional foresters who care about power and money alone cannot explain the pervasive unquestioning of scientific forestry knowledge in Tanzania. If anything, we see local communities and NGOs criticising government foresters for violating scientific forestry principles as well. The chapter submit that the taken for granted assumptions, concepts, and perceptions (doxa) are also responsible for the contradictory practices.

7.2Policy influences on the forest management field

This section examines the framing of participatory forestry as spelled out in the forest policy text.[39] Frames (principles and assumptions) can be implied or stated explicitly. Schön and Rein (1994:34) cited in Forsyth (2003) write:

> "The frames that shape policies are usually tacit, which means that we tend to argue *from* our tacit frames *to* our explicit policy positions. Although frames exert a powerful influence on what we see and how we interpret what we see, they belong to the taken-for-granted world of

> policy making, and we are usually unaware of their role in organizing our actions, thoughts, and perceptions" (emphasis in original).

'The taken-for-granted world of policy making' here refers to doxa in Bourdieusian language. It refers to the sort of assumptions that 'go without saying' but influence our definition of the problems and choice of policy to address them. Thus, the aim in this section is to examine the taken for granted principles and assumptions underlying the participatory forestry as spelled out in the forest policy. It is argued here that forest policy frames the problem in a way that render technical solutions indispensable. The framing presumes the production and circulation of scientific forestry knowledge, further perpetuating the established scientific order in the forest management and constricting possibilities of revising the scientific forestry habitus.

7.2.1 The framing of the problem

In Tanzania, the forest policy is based on a narrative of blame – blaming human activities, particularly activities of local communities, for deforestation and forest degradation.[40] The policy indicates that there are more forests on public land (outside of reserved land), which lack proper management and thus "under enormous pressure from expansion of agricultural activities, livestock grazing, fires, and other human activities." (URT, 1998). While the policy admits that deforestation and forest degradation occur in reserved land as well, it states that there are more destructions in unreserved land because human activities are unregulated (URT, 1998). As we will see in the coming sections, weak enforcement of regulations due to inadequate funding and staffing are stated as reasons for the occurrence of the otherwise prohibited human activities in the reserved and unreserved land. Further, the policy notes that insufficient resources to compensate dwellers and shortage of land for human activities undermine conservation ambitions through creation of new protected areas.

The policy identifies as its goal "to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations" (URT, 1998, p. 14). The policy looks to specifically sustain materials obtained from forests. It vows to ensure sustainable supply of forest products and services, and conservation of forest biodiversity, water catchment, and soil fertility. This would be achieved by putting "sufficient forest area under effective management" and ensure that forests are managed as per inventory-based forest management plans (URT, 1998). As illustrated in the Namatunu case described in chapter 6, the Mtanza-Msona case, and foresters' justification for double standards described later in this chapter, sustainability in practice means non-declining supply of timber and 'no touching' the forests for its catchment and biodiversity values. In any case, achieving sustainability is framed to involve regulating activities of communities living

within or adjascent to forests. This is illustrated in the TFS campaign to evict people who have settled in forest reserves, the crack down on livestock grazing in forest reserves, and the representation of charcoaling as responsible for dessertification (Interview #84). It follows from the vision of local communities as destructive and ignorant for not valuing the forests, the view that is cultured in forestry classrooms as described in chapter 5.

It is important to note that sustainable forest management as understood by foresters does not necessarily invoke the notion of sustainability as in 'teach a man to fish'. It is not so much about the concerns for the poor of each generation. It is about forests and timber and other forest materials. In other words, it is more needs-based than freedom-based in which human freedom is elevated including "the freedom to fulfil our needs" and the "liberty to define and pursue our own goals, objectives and commitments, no matter how they link with our own particular needs" (Sen, 2013, p. 6). Freedom-based conception of sustainability emphasizes on "sustaining freedom (not needs) of future generations to live the way they like and what they have reason to value" (Sen, 2013, p. 10). The implication of freedom-based conception of sustainability is that local communities shall be afforded a considerable latitude to choose and decide about what to do with their forests – something that they may have reason to value. Foresters' conventional conception of sustainability involves alienating or controlling human interactions with forests in order to ensure that the supply of valuable forest products is non-declining over time. In this sense, experts decide and prioritize on the needs to be sustained and rally local communities into making choices and decisions to sustain those needs. This approach means that sustaining livestock grazing may not be prioritized, even though people may have reasons to value it; sustaining timber production may, even though people may not have reasons to value it. Further, the needs-based sustainability presupposes the rationality of calculative forestry and thus reinforces the production of scientific forestry knowledge.

Since communities are represented as having no reason to value the forests, it follows that professional foresters must closely guard their involvement in forest management. Thus, the policy demands that local communities managing VLFRs must adhere to the approved inventory-based management plans. Tacitly, the architects of the policy make several assumptions. If local communities (whose practices are thought to destroy forests) are to be trusted to manage forests, they must do so under the tutelage of qualified professional foresters. Knowledgeable conductor must conduct their forest management practices. Further, for architects of the forest policy, the policy is practical and implementable, and it will be implemented as scripted. Ignored is the fact that local communities are not trained professional foresters and thus are unfamiliar with the language of quantitative forestry inventory, technical forest management planning, forest

monitoring and reporting. Asking local communities to act as professional foresters becomes akin to asking a traditional healer to perform a bypass surgery.

To sum up this section, the participatory forestry policy is predicated on the belief that communities are inherently anti-forests. As one forester in high position put it at a meeting in which he was arguing against the sustainable charcoal project, "some local communities just hate trees. They don't want to see trees standing (Field notes #143)." He meant that for people who already hate trees, encouraging them to produce charcoal is a disaster and exceedingly unprofessional. Based on these perceptions, making participatory forestry technical is seen as a natural thing to do lest the country turn into a desert. The observation that technical framing is not only supported by government foresters suggests that there is more to it than simply intentional pursuit of power and forestry benefits. The technical framing of participatory forestry is also supported by non-government foresters who stand to personally benefit the least from such framing and more from successes of participatory forestry (Interview #121). It is also supported by NGOs that have been criticizing TFS for harvesting without inventory-based plans and who claim to defend the interests of local communities (Field notes #134 & #144). Whether professional foresters stand to benefit from the technical framing or not, they are all united by the vision of communities are hurting the forests, and that forestry and forest management is a technical venture. They are also united by the belief that technical forestry produces sustainability. The observed general consensus defining the forest management field is indicative of shared dispositions and presuppositions.

Even when its implementation has been elusive thus far, the unquestioning of the technical framing of participatory forestry is noticeable. Mathews (2005) argues that just because official knowledge is not contradicted publicly, it does not mean it is accepted or internalized. Still, public secrets – the things foresters choose to ignore/not to know - are a good place to look for signs of internalization or taken for granted assumptions, especially the justifications stated or implied for them. For our case, whether pursuing self-interests or not, foresters (and even non-foresters) appear to be disposed towards technical approaches and the will to regulate activities of local communities in relation to forests. Foresters do not pause and ask at every moment whether to frame forestry policy and practices in technical terms or not. My own experience as a wildlife officer at the wildlife department under MNRT attest to that. I handled community-managed wildlife management areas (WMAs) desk, reviewing applications for registration of new WMAs and following up on the performances of the existing ones between 2005 and 2007. We required technical management plans for WMAs not because we derived personal benefits from it. We did so because (1) the law required technical management plans and (2) we wanted to ensure proper

wildlife management. We took it for granted that technical management plans were necessary because communities could not accomplish the task of wildlife management on their own. We imagined that these plans will guide management of wildlife. Even though we knew that plans are rarely implemented, we kept on enforcing the prescription.

The next sections present more cases showing persistence of scientific forestry practices amidst contradictions and limitations that end up undermining the very goals of improving forest management. The aim is to show that this persistence cannot be explained only by end values (money, power) that foresters and their supporters intentionally seek to achieve (Swidler, 1986). We see that taken for granted assumptions (doxa) or culture play a role in shaping practices. These practices also show that for one to be successful in the forest management field, he/she must learn to live and act like a professional forester (Garland 2006). This further reinforces the banking pedagogy and curriculum described in chapter 5, and the production of scientific forestry knowledge by forestry academics as described in chapter 6. Further, the practices described here illustrate instances of symbolic violence (Bourdieu, 2001).

7.3In a Hammer We Believe

Since 2006, the two villages of Nyamwage and Tawi in Rufiji district have been engaged in CBFM with the prospect of harvesting timber from their VLFRs. So far, without success. The two villages received financial and technical support from WWF as part of its effort to conserve East Africa's coastal forests.[41] As many other villages, the two villages decided to start with a period of no harvest to allow for the forest to recover and for the transition between "no management" to "management" (Indufor, 2014; Interview #42). Consequently, the first management plans of 2006 - 2010 did not estimate harvesting levels. Revision of the plans arrived in 2009, in which harvesting was allowed. Around the same time, the two villages joined the Forest Stewardship Council (FSC) forest group certification scheme under the tutelage of a local NGO, Mpingo Conservation and Development Initiative (MCDI). The revised plans were subsequently approved by the Rufiji district authority in 2010 (Interviews #51, #89 & #91; Field notes #52).

In Nyamwage and Tawi villages, local communities thought they had met all the requirements for harvesting. But DFO for Rufiji district reminded them that the law requires a village to obtain a hammer to mark stumps and cut logs.[42] With the support from MCDI, the two villages applied to FBD for a hammer for the first time in 2010. Since then, they wrote several letters and made several trips to the district headquarters and FBD headquarters in Dar es Salaam to follow up on

their request. The hammer could not be obtained as soon as it was expected. Officers gave several excuses including cumbersome procurement procedures and the government need to plan for a better disposal of village-designated hammers. Anticipating the long process for a village to obtain a hammer, the guidelines for harvesting in VLFRs suggest that the hammer held by the DFO be used in the meantime (URT, 2013). However, the Rufiji DFO refused to hammer logs and stumps in VLFRs.

As the promised financial benefits were not forthcoming, local communities were increasingly frustrated. The waiting had been far too long. It was becoming increasingly difficult for local communities to guard the forest against timber theft. Unauthorized harvesting in the two villages reached an alarming rate (more so in Nyamwage). Log smugglers were taking advantage of the situation. "*Did you see bicycles and motorbikes carrying logs* (locally known as viringo, small logs used for making legs of chairs, tables, and beds) *plying between Nyamwage and Ikwiriri*?", ask MCDI staff. "*All those logs are from Nyamwage and Tawi village land forest reserves*."[43] (Field notes #52). A village leader put it this way:

> What has caused us the most damage, it is the delay on the side of the government to allow us to harvest from our forest reserve. It has taken very long to get that permission to the extent that when the forest was ambushed by illegal loggers from the neighbouring villages and after we have run out of energy to protect the forest, our fellow villagers thought, 'Ah! we are taking care of this forest and people from outside are coming to harvest it and when we arrest them and take them to court, the punishment delivered do not match the extent of the damage they have caused'. That is why some of our own villagers have decided to go around us and carry out destructive activities in the forest (harvest from the forest) (Interview #91).

In 2015, the hammer finally arrived.[44] However, it was not handed over to the village leadership. Rather, the village-designated hammer for marking timber harvested in VLFRs was entrusted with the DFO. Thus, rather than reduce villagers' dependency on the DFO, the arrival of the hammer amplified it. To harvest in VLFRs, the DFO must be present to mark logs and stumps. Otherwise, transit permit (TP) to transport timber and logs to other districts cannot be issued. In absence of the permit, formerly issued by DFO and now by TFS District Manager, timber/logs would be deemed illegal. Villages must arrange and facilitate the presence of the DFO. This entails paying for transport cost and allowances. Village leaders see this as a problem and they would like to be entrusted with the hammer. However, the hammer cannot be given to them, they were told, because they are not qualified to measure timber/log volumes. Village leadership disagrees. With the training they received, village leaders argue they can measure timber/log volumes. Even if they cannot, they think they should be educated to so. Otherwise, they suspect rent-seeking on the part of DFO, as this quote illustrate:

> They are saying we are not educated. Why don't they educate us then so that we can be trusted to do everything ourselves? They are saying we don't know how to measure (volume). We are saying we know. We have been trained how to measure cubic meters, we know. We absolutely have the capacity to measure logs (diameter) and determine which one has the size allowable for harvesting. But they have decided to make it bureaucratic. And if you just look at the log, you know how many rounds (pieces) you will get. Absolutely. And you get exactly the same number of pieces (of timber) to what you estimated in your head (Interview #91).

When the hammer arrived, MCDI reasoned that it would be important to harvest immediately to salvage villagers' interest in forest management. Accordingly, village governments, DFO, and MCDI agreed to harvest 20 cubic meters. The 20 cubic meters were not prescribed in the harvesting plans. MCDI and the DFO no longer trusted the approved plans. Too much unauthorized harvesting had taken place in the village reserves between 2010 (when the plans were prepared) and 2015. Yet, harvesting 20 cubic meters was considered safe and would be enough to pave way for the revision of the existing management and harvesting plan. The fact that the plans were due to expire in November 2015 added to the urgency. After November 2015, it would be impossible to do any harvesting before new/revised plans could be drawn up and approved. MCDI also reasoned that some harvesting would go a long way to assuage the donor, WWF, who was uneasy about the outcome of earlier support. It was important to demonstrate that WWF earlier support was not all wasted before applying for a new grant to pay for the review of the plan. This is an example of technical management plans following rather than preceding forest exploitation (Hansen & Lund, 2017). Citing Callon (1998), Sullivan (2017:405) makes a similar point that measurements, calculation, and modelling often "make or perform the world that is thus counted, as opposed to simply capturing a picture of a world that exists."

Village leaders and MCDI have reservations about the Rufiji DFO interest in supporting the villages and vested interests. Village leaders wish for the transfer of DFO to other districts. In reflecting on the endless list of requirements presented to them by the DFO, a village leader said "he is imposing all these restrictions because he wants us to fail. He is so mean. If I had the power, I would say he should go and work elsewhere. He is not needed here in Rufiji (Interview #91)."

This case illustrates the contradiction of framing participatory forestry in technical and procedural terms and how such framing can be counterproductive. While the hammer brings personal profits to foresters, further probing of foresters by pointing out the contradictions reveal that they also genuinely think that the hammer is necessary for sustainability. Marking timber with a hammer is an old and common forestry practice – so old that it now goes without saying that it produces sustainability. It is hard to find a forester in Tanzania reflecting on the link between a hammer and sustainability. I asked a seasoned forester at the forest department headquarters in Dar es Salaam,

why the hammer? Surprised at my ignorance about the importance of a hammer in forestry, he said:

> "Clearly you are not a forester. The hammer has two sides: one side for marking legally harvested logs, and the other side marking illegals. It is useful in stopping log theft, aid in tracking the movement of timber and provide deterrent to illegal actions. Marking helps with law enforcement and verification" (Interview #81).

The usefulness of a hammer perhaps ends there – aid law enforcement. Its role in ensuring sustainability is questionable. Timber and logs harvested from forests without inventory – based plans are also marked.

The hammer is not simply about pursuit of personal profits, it is cultural. For one thing, high level foresters at the headquarters leading policy making are unlikely to directly benefit from the hammer in a way that field level officials do. Yet, these high-level officials believe in a hammer as an instrument for sustainability. Further, if village forests are well managed, individual foresters and perhaps more so forestry institution will receive praise. It is thus argued here that state foresters do not ignore what happens to the forests. Much as they may have a penchant for nefarious activities, that is not all. They also produce what to them appear as legitimate and appropriate practices in forest management. Acquisition of dispositions on the importance of a hammer precedes the collusion and abuse of the hammer for personal profits. If foresters did not believe in the hammer in the first place, opportunities to abuse could not have emerged. The hammer is so precious to foresters that one can go to jail for losing it. The requirement for the hammer was not going to change irrespective of whether the village designated hammer exist or not.

The hammer case is a good example of a public secret – "the information that foresters choose to keep from themselves, like, *the don't ask, don't tell, don't pursue*"[45] – and official ignorance (Mathews, 2005). Professional foresters know it is probably unrealistic to expect that the hammer will be used as stipulated in the regulations. Further, it is known to everyone that most production forest reserves and general land have no management plans (more on this in the next sub-section), which makes the hammer of little value to forest management other than enabling state revenue collection. Professional foresters at the headquarters know that it is very unlikely that logs and stumps are marked on site. Lower level foresters know that they are not stamping logs and stumps. Yet everyone is refraining from asking and disclosing what is happening in practice. Professional foresters have chosen 'not to know' that stamping is not taking place on site and the hammer can legalize illegal and unsustainably harvested timber as well. According to Mathews (2005: 816), "the official acts of ignoring and collusion which maintain public secrets and official ignorance" is as much a source of power as is official knowledge. Revealing and accepting that the hammer is not necessarily synonymous to sustainability will dent the power vested on state foresters.

7.4Exploitation without plans, plans without purpose

Given the scientific forestry habitus and doxic thinking in the forest management field, we expect foresters to consistently and persistently insist on technical inventories, management, and harvesting plans. All their actions should thus be premised on the claims for the principles of scientific forestry. Foresters do actually make scientific forestry claims consistently and persistently. They do require technical plans for exploitation in VLFRs. Yet, exploitation has been allowed without plans in general land and for many years in forest reserves. That is, where there is a possibility of technical management i.e. forest reserves, there has been legal exploitation without plans and where there is little or no possibility of technical management i.e. village land, there is a strong call for technical plans.

Tanzania Forest Service (TFS) is managing a total of 455 forest reserves covering 14,256,133.03 ha. Over two-thirds of these reserves are managed for production. In 2010/2011, only 13 production forest reserves covering 3,799,584 ha had management plans and all these plans expired as of 2015 (Table 7). Between 2011 and 2014, TFS prepared management plans for nine production forest reserves covering 273,274 ha and these plans expire in 2020 (Table 7). Out of 455 forest reserves, fewer than 30 have ever had a management plan as of 2014. In other words, out of the 14,256,133 ha of reserved forests, only about 5 million ha were managed as per approved management plans at some point.

Table 7: *Production Forest Reserves with Management Plans*

S/N	Name of Forest	District	Area(Ha)	Status of Management Plan
1	Makere North	Kasulu	78,995	Expire in June 2019
2	Uvinza	Kigoma	16,835	Expire in June 2018
3	Mkweni hills	Kahama	15,929	Expire in June 2019
4	Kilindi	Kilindi	10,102	Expire in June 2017
5	Manga	Muheza	1,635	Expire in June 2017
6	Korogwe Fuelwood	Handeni	10,805	Expire in June 2017
7	Kipembawe	Chunya	3,150	Expire in June 2020
8	Kalangali	Chunya	2,260	Expire in June 2020
9	Kalambo River FR	Kalambo	41,958	Expire in June 2020
10	Msagania	Mpanda	85,214	Expired in June 2014
11	Mulele hill	Mpanda	519,211	Expired in June 2014
12	Mpanda North-East	Mpanda	502,461	Expired in June 2014
13	Nyonga	Mpanda	578,624	Expired in June 2014
14	Rungwa river	Mpanda	401,462	Expired in June 2014
15	Ugalla river	Mpanda	427,350	Expired in June 2014
16	Igombe River	Nzega	37,296	Expired in June 2013
17	Ilombero Hill	Nzega	35,224	Expired in June 2015
18	Itulu Hill	Tabora	388,512	Expired in June 2015
19	Nyahua Mbuga	Tabora	679,896	Expired in June 2015
20	Igombe river	Urambo	210,049	Expired in June 2015

S/N	Name of Forest	District	Area(Ha)	Status of Management Plan
21	Mpanda Line	Urambo	427,363	Expired in June 2015
22	Ugalla North	Urambo	278,423	Expired in June 2015
	Subtotal		**4,752,754**	

Notes: Plantations are not included. Management plans for the top nine reserves were prepared during the implementation of the first TFS strategic plan.
Source: TFS (2014)

When TFS took over in 2010/2011, its first major decision was to suspend harvesting in production forest reserves, boundary resurveying and consolidation, management planning, and appointment of a management team for each reserve (TFS, 2014). As of January 2016, boundaries of 235 forest reserves were marked/strengthened, with 3,006 beacons and 4,728 signboards installed (TFS, 2016). Maps for 40 forest reserves were updated. While measures are implemented to improve management of reserved forests, none are taken for forests on general land. Neither inventories nor management plans exist for forests on general land. Yet, TFS issued no harvesting ban as it did for reserved forests. It instead ramped up harvesting on general land (**Error! Reference source not found.**).

Table 8: Major products harvested from natural forests on general land and production zones of mangrove forest in Rufiji Delta

PRODUCT/YEAR	2011/12	2012/13	2013/14	TOTAL
Logs (CM)	14,140.00	29,100.30	21,378.00	64,618.30
Fuelwood (CM)	701,264.00	54,359.90	86,163.60	841,787.50
Charcoal (Bags)	265,966.00	641,703.20	1,000,837.1	1,908,506.30
Poles (RM) including mangrove poles	552,300.00	235,739.40	706,550.90	1,494,590.30
Sawn Timber (CM)	97,834.20	409,866.60	485,015.20	992,716.00

Source: TFS (2014)

District harvesting plans are supposedly prepared every year. Ideally, the district plans are prepared by district forest manager every year and approved by TFS zonal manager before the start of harvesting season/financial year. These plans are intended to guide harvesting on general land, which include unreserved portions of village land. They are the preconditions for allowing harvesting in a district. Some TFS foresters claim that these plans are in place. At a workshop organized by a local NGO, Tanzania Forest Conservation Group (TFCG), to discuss draft harvesting plan for Kilosa District, a TFS representative responded to a call for other districts to emulate the Kilosa example by saying;

> "District harvesting plans are available. We never allow harvesting without a harvesting plan. It's only Kilosa, which was lacking a harvesting plan. The problem lies in the implementation and not absence of the plans." (Field notes #44)

Not everyone at the workshop agreed. In fact, many disagreed with the TFS official assertion. One disappointed participant responded:

> "It is true that we have had these plans prepared, but how were they prepared? What is the quality of these plans? It was mainly copy and paste, and they never reflect the reality on the ground. If you visit any DFO office today, you will find these plans. But the question is: how were they prepared? It is absolutely important to recognize weaknesses in the way we used to prepare these plans and adopt the Kilosa new version as a template." (Field notes #44)

District harvesting plans are mainly produced to meet the requirement for harvesting on general land. The plans are generally not based on any inventory. At the TFS headquarters, I did not meet anybody who is aware of the contents of these plans. In Rufiji district, the plan is just rough estimates of what can be harvested based on last year's numbers. DFO and DFM admit plans are not based on updated and detailed inventory (Interviews #51 & #92). The last district-wide reconnaissance forest inventory in Rufiji was conducted in 2005 (URT, 2015). Even though the inventory was not detailed and is now old, DFO and DFM think it offers a good benchmark as amount harvested are consistently lower than estimated. Forest officers at the district know that the proposed harvesting levels may not produce sustainable forest management. They also believe in serendipitous forest management when somehow baseless harvesting levels turn out to be sustainable.

To the district foresters, the alternative is not to let anyone guess harvesting levels. They would rather suspend harvesting on general land, conduct detailed inventory, and draw up a proper harvesting plan. Yet, suspending harvesting is undesired because it cripples revenue generation. It is also impractical to inventory forests on general land because of the difficulties of locating general land on the ground – its boundaries are unknown and in most cases forests on general land are forests on village land. Despite claiming ownership of trees on general land, TFS has no control of the land. The situation on general land is such that *"you identify trees for harvesting today and you come back in few weeks, they are gone"* (Interview #92). The contradiction is when state foresters claim harvesting in general land is sustainable while they are not managing the harvested forests. Further, government own policies have complicated the matter by turning forests on general land from commons (especially the general land on village land) to open access situation. As Sullivan (2017) note, treating resources as open access is a strategy to displace local claims and facilitate grabbing by outsiders. In this case, designating trees as being on general land makes it easier for the state to appropriate the resource (Sungusia & Lund, 2016). General land (specifically trees found on it) virtually belongs to nobody, which complicates any attempt to manage them professionally. That will not prevent professional foresters from allowing timber traders to harvest them and from claiming that they are managing them professionally.

It can be argued that since professional foresters are willing to allow harvesting even where inventories and management plans are lacking, claims for the primacy of scientific forestry principles are a façade far from being internalized. For instance, revenue collection targets seem to prevail over the desire to ensure sustainable forest management (more on this later). That is arguably a hasty conclusion. Professional foresters know when they are not adhering to the principles and they feel guilty about it. They know that when they violate the principles, their practices are less defensible. The desire is always to uphold the principles, even when doing so seems impractical. TFS, which was established to, among other things, uphold sound principles of forestry, is an indication of this desire. The decision to suspend harvesting in forest reserves to allow for boundary consolidation, evictions of forest dwellers, inventories, and management planning is a highlight of strong belief in scientific forestry principles. These efforts to manage forests scientifically are repeated over and over again even against the backdrop of a rich history of failures.

TFS has endured a persistent vote of censure from concerned foresters and NGOs for intensifying harvesting from unmanaged forests on general land. A chorus of voices criticizing the practice got loud enough to catch the attention of the Prime Minister. In Rufiji district, the Prime Minister banned all forest harvesting and suspended the DFO and DFM. A stakeholders meeting was called involving government ministers in which more criticisms were levelled against the practice. The ministers instructed that TFS should stop harvesting forests (including forests on general land) lacking management plans. TFS is now prioritizing on forest inventories. In early 2017, inventory convoy was criss-crossing the country carrying out inventories and stopped at least once at SUA for a refresher class. As pointed out earlier, the problem of managing forests on general land is more than just absence of inventories and plans. The general land does not belong to the TFS; trees on general land do. A villager can clear a portion of general land to start a farm. It becomes a problem and TFS is involved if she converts trees cut in the process into lumber and charcoal. The government ownership of trees on general land creates a perverse incentive discouraging proper management of forests (Sungusia & Lund, 2016).

In criticizing TFS, concerned foresters and NGOs ignored the complexities of managing forests on general land – they pressured TFS to draw up inventory-based plans. But even with inventory-based management plans, local realities and the fact that TFS cannot restrict access to general land make it unrealistic to equate technical management plans to sustainable forest management. Concerned foresters and NGOs take it for granted that technical management plans will produce sustainability. They have come to accept the premises underlying technical management plans

through the processes of inculcation specified by Bourdieu (Bourdieu, 1990, 2001). The criticisms are yet another indication of doxic thinking in the forest management field in Tanzania.

Perhaps, forests on general land might be better managed by entrusting its management to the local communities living nearby, rather than trying to impose technical procedures from a far. Apart from revenue ambitions, scientific forestry habitus and technocratic doxa arguably make professional foresters unable to make such considerations. The next section delves into the justifications given by professional foresters for the seemingly double standard: more rigorous application of scientific forestry principles to VLFRs than general land and forest reserves.

7.5Foresters' justification for double Standards

While forest harvesting took place without management plans in production forest reserves up to the arrival of TFS in 2011 and on general land up to recently, the same was (and still is) not possible in VLFRs. Villages such as Tawi, Nyamwage, Mtanza, and Msona in Rufiji district have trees on both the reserved portion (VLFR) and unreserved portion (general land) of village land. These villages are not allowed to carry out harvesting in VLFR in absence of, among other things, detailed inventories, management and harvesting plans. Allowing exploitation of forests in general land without plans while prohibiting the same in VLFR is a case of double standards. Larson and Ribot (2007) observe similar cases in Senegal and Honduras and conclude that double standards are deliberate moves to favour commercial interests at the disadvantage of rural poor. While the analysis here shows that commercial interests are favoured, questions remain: Does the seemingly instrumental use of scientific claims mean that foresters are not predisposed towards privileging scientific forestry? Does that mean they don't genuinely believe in scientific forestry? To answer this question, I examined the justification provided by foresters for the double standards. Specifically, state foresters gamble with sustainable forest management on general land by allowing harvesting without inventories and management plans. Why aren't they willing to let villagers gamble as well?

Foresters are surprised by this question. They accept the assertion that the practiced scientific forestry is anything other than a project of scientific certainty. But disagree with the suggestion that villagers should be afforded the same latitude to gamble. State foresters' gamble is considered safer because it is based on professional knowledge and quantitative thinking. Villagers' gamble is rejected for involving none of these. Villagers may have a better practical knowledge of the forests, but they cannot quantify things. Thus, it is difficult for them to make any projections – they just harvest the forest until nothing is left. A senior state forester at the headquarters put it this way:

> Yes. We are all gambling because nobody is 100% sure. But we are gambling at different degrees. Foresters' gambling has some basis and thus there is a chance of getting it right. Villagers' gambling, on the contrary is probably based on nothing. It is thus less defensible and of lower value. Also, villagers do not engage in quantifying things. But I see your point. Actually, villagers are probably more knowledgeable than scientists. Consider this, in our research; we interview villagers and not professors. Why? If professors are more knowledgeable, we should be interviewing them in our research. Instead, we all head to villages, to learn from villagers. Villagers can just look at the sky and tell you that it is going to rain. But weathermen, armed with loads of probability calculations, get it wrong all the time. When I was growing up, I used to see villagers in my village harvesting following some pattern: they will start from the periphery or at the centre, based on some criteria. Agroforestry emerged out of what villagers used to practice in some areas. Science will be a lot more successful if it seeks to build on local knowledge rather than replace or ignore it. (Interview #82)

Foresters' stated justification for the double standard reveals doxic thinking, the taken for granted assumption that calculative forestry is the way to manage forests and thus villagers are not able to manage forests sustainably without a professional forester's prescriptions. These assumptions are widely held even when we know that villagers can quantify, albeit differently. It is well known that a seemingly innumerate pastoralist can tell when just one animal out of a thousand fails to return home after a day of grazing (Homewood, 2008 *cited in* Sullivan, 2017). But for many foresters in Tanzania, it goes without saying that villagers are myopic and pursue short-term needs at the expense of the long-term viability of the forests they depend on. As one academic reasoned, "villagers are hungry, and you cannot ask hungry people to look after the forest" (Interview #27).[46] As Li (2007) note, foresters bestow upon themselves a role of trustees with the task of improving not only forests condition, but also the condition of villagers and their interactions with forests.

Since it appears so obvious to foresters that villagers are incapable of producing SFM in absence of prescriptions and supervision, state foresters are unable of realizing the unintended consequences of the technical framing of community-based forestry, which undermines the very sustainability they are rooting for. They accept the double standards. But their solution to the double standards is not to deregulate management of VLFRs and simplify community-based forestry. They instead vow to implement higher standards in forest reserves and general land as well. Foresters seldom question the relevance and merit of scientific forestry as a basis for the management of forests, especially natural forests (miombo). It just occurs to them that emphasizing on technical forestry approaches is the appropriate way of doing forestry, and the alternative is just unprofessional. A senior forester directing the management of natural forests summed it up as follows:

> The law requires management plans. But costs etc. make it impossible to have these plans for all forests. But even without management plans, the government still manages these forests. It is not true that no management plan, no forest management. Management entails harvesting,

> among other things. Is our harvesting shambolic? No. I disagree. For villages, we are strict because we want to create a sense of value for management plans. We want villagers to embrace the value of management plan in the management of forests. To say that because the government does not use management plans in managing forests, then villages should also be allowed not to have management plans is wrong. We are yet to come across a situation in which villages resist the requirement for management plan. It's now a high time we say management plan is a priority. And nothing should take place in a forest (government owned or not) without a management plan. And yes, harvesting is taking place on general land where no management plan exists. It is not our intention to destroy these forests and make life difficult for villagers; we are just trying to build something important for our forests – to ensure proper management of our forests (Interview #88).

So, foresters justify the double standards by pointing to the villagers' lack of scientific forestry culture and the necessity of inculcating that culture on them. The stated justifications reveal the unwillingness of foresters to question the necessity and relevance of scientific forestry to the management of forests, miombo woodlands in particular. They insist on the primacy of scientific forestry even in the face of inadequate ecological knowledge on miombo woodlands. While the literature on natural forests (miombo) is burgeoning, the knowledge of these biomes is still feeble. As discussed in chapter 6, most of the work on miombo focus on biomass and volume modelling, some on fire ecology, some short-term studies on recovery following disturbances such as logging and shifting cultivation and almost none on ecological interactions, interdependence, and functions. Attempts to establish growth rates for most indigenous timber species are quite recent (Mwakalukwa, 2014). The scientific management of miombo woodlands is thus marred with uncertainties. Still, foresters are unwilling to rethink the scientific forestry approaches; the will to improve is not letting up (Li, 2007).

Are anticipated personal profits the only thing making foresters take sanguine views of scientific forestry and glorify the double standards? To be sure, personal profits cannot be ruled out. But in my interactions with foresters, I did not see anything to suggest that foresters deliberately invoke technical practices to compromise forest management and villagers' livelihoods. This suggest that something more deep-seated is responsible for shaping these practices. I argue that the scientific forestry habitus and doxic thinking limit foresters into constructing technical practices and make them unable to acknowledge the contradictions in these practices. It is taken for granted that villagers are expected to be ecologically noble savage (Hames, 2007). This is problematic in itself as it frames villagers' practices in 'Euro-North American cultural terms' (Nadasdy, 2005). Further, the glorification of double standards is a symptom of symbolic violence - professional foresters (and villagers) misrecognize the violence in their actions because it is subtle and gentle but brutal in its effects and wielded through practices that appears obvious, natural, and appropriate. This makes rethinking of the technical approaches in participatory forestry unthinkable.

7.6 Enforcing the law, ignoring the context: Vulnerabilities, Uncertainties and Manufacturing Certainty

Professional foresters, and in particular state forestry officials, speak authoritatively. Looking at the way they portray themselves, it is easy to think that their authority is infrangible. However, as Mathews (2011) observes in his analysis of Mexican forestry, they possess "uncertain authority" (4). This uncertainty owes to, among other things, the knowledge forming the basis of their authority, which is partial and often incompatible with local realities. On paper, national forest reserves have been under the management of Forest and Beekeeping Division (FBD) in post-colonial Tanzania. On the ground, peasants and livestock keepers effectively couldn't tell whether they have entered a forest reserve and encountered weak resistance when they settled in and utilized resources in the reserves. Foresters agree that government can be blamed for delayed enforcement of the law, which allowed people to settle in reserves (Field notes #83). But they argue that is not an excuse for not enforcing the law now and evict the people who have settled in the reserves.

The delayed enforcement of the law has serious consequences. When reserves are gazetted, implementation is delayed for years to come. When the reserves' boundaries are finally enforced, the realities on the ground have changed. The result is (violent) conflicts around protected areas. When TFS took over the management of forest reserves in 2011, one of its first major activities was eviction of people who settled in the reserves. **Error! Reference source not found.** shows the list of forest reserves in the Western zone where evictions took place between 2011 and 2016. Virtually, all reserves have had illegal settlement issues (Interview #84).

Eviction campaigns do not sail unchallenged. The biggest challenge comes from elected officials supported by their electors, the evictees. The TFS managers for lake and western zones reported politics as the biggest challenge to their efforts to enforce the law. One forester declared "*political interferences and institutional conflicts e.g. establishment of villages in forest reserves*" and the other reported that "*planned evictions have been postponed until further notice due to political influences*" (Participant observation #139). Some of the evictees have lived in these reserves for more than 25 years (e.g. Geita Forest Reserve) before TFS arrived to tell them that they are illegal settlers. The question put forth by the evicted people and elected officials is: *where were you all this time? Why didn't you say something when people were establishing themselves in these lands?*

Table 9: List of Reserves where Evictions Took Place, Western Zone

S/N	Name of the Reserve
1.	North Ugalla
2.	Mpandaline
3.	Nyahua
4.	Makere
5.	Mkuti
6.	Basanza
7.	Illomelo Hill
8.	Igombe river
9.	Swangala
10.	Msanginya

Source: Own Survey Data (2016)

Members of Parliament representing constituencies in which livestock herders are the majority call for herders to be allowed to graze in protected areas and for some of them to be de-gazetted.[47] The Vice President of Tanzania - whose office is responsible for overseeing environment portfolio countrywide – partly heeded to the call and suspended the removal of livestock from protected areas until further notice.[48] The Deputy Minister for Natural Resources accompanied by the Minister for Agriculture put on hold the drive to remove livestock from protected areas (forest and game reserves) and they vowed to make more land available for livestock grazing. The Minister for Natural Resources and Tourism, in several occasions in 2016, suspended slashing of crops planted in reserves until post-harvesting. Even though the stance has since been reversed and 2017 started with the campaign to remove livestock from protected areas in Kagera Region, this case illustrates that ministers succumb to pressure from elected officials and at times ignore technocratic advice to the chagrin of professional foresters.

State foresters are unwilling to reconsider their approaches given the prevailing political environment. They are aware that de-gazetting forest reserves or portions of it would create a bad precedence and put their career at risk. I suggested to a senior forester that freeing contested portions of reserves was a sensible way forward in which he responded:

> The responsibility to de-gazette forest reserves is vested with the Minister as he sees fit – when he is convinced it is appropriate to do so. Our job, as technical people, is not to de-gazette but rather to remove illegal settlers and plant trees (to restore degraded areas). If I am asked to provide my opinion on whether to de-gazette, what would it be? My job is to protect forests. Now if I support de-gazettement, where will I work? So, we (professional foresters) cannot allow de-gazettement. That will be against our professional ethics (Interview #84).

Personal interests to protect careers are partly responsible for professional foresters' insistence on technical solutions to inherently political problems. At the same time, professional norms are also influential. To professional foresters, de-gazettement leads to deforestation in which services such

as carbon storage and water retention are lost. Further, the population of illegal settlers in forest reserves will certainly grow. So, it is better to remove them today because if they are allowed to settle today, they surely will eat into more reserved land when their population expands in the future. In this scenario, the job of a professional forester cannot be to de-gazette reserves.

From foresters' point of view, politicians' actions are indefensible and undermine environmental conservation. Foresters are unable to realize that votes or no votes, the outcome of elected officials' actions to defend the rights of local populations might be more socially acceptable and render forest management more feasible. The doxic thinking is also preventing them from seeing the limitations of technocracy in solving political problems. Foresters disagree with the suggestion that insistence on evictions might work to marginalize their professions as described by Hurst (2003). They argue all they are doing is to enforce the laws which were passed by the parliament. If politicians want to allow grazing and settlements in protected areas, they should first change the laws. I suggest to foresters that informality is a reality and ask them to comment on the Vice President's "illegal" decision to suspend removing people and livestock from forest reserves until further notice. One senior forester argued,

> *A senior forester*: What TFS is doing is just to enforce the law, which was passed by the parliament and not TFS. TFS did not create these restrictions. If the Vice President does not like evictions, she should cause for the law to be changed and if people agree that we do not need forests, so be it. But the law as it is stand, she cannot issue orders that contradict the law of the land.
>
> *Interviewer (me)*: But these restrictions were based on experts' advice?
>
> *A senior forester*: Yes. But experts do not make laws. Politicians make laws. And they agreed nobody should live in a forest reserve. And nobody should graze in a forest reserve. This is what we have at the moment. And if TFS fails to enforce the law, the same politicians will be the first one to scorn TFS and call for people to be sacked. These politicians are causing confusion. Once you declare that the government is no longer evicting people from forest reserves, what do you expect? Are we going to remain with any forests? (Field Notes #83)

Professional foresters do not consider their actions to be political. Politics is the confine of elected officials, they imply. Seeing politics as an obstacle, rather than a tool to reconcile multiple and competing interests over forests, is arguably part of the problem. This puts state foresters "out of step with more powerful constituencies" (Hurst, 2003, p. 359). Arguably, foresters can save their profession from marginalization by acknowledging local uses of forests and seek for political solutions to the sustainability challenge. But the doxic thinking that sustainability requires separating people and nature, and the ambition to conserve pristine wilderness make foresters relegate local forest uses to lower division. It follows that even if foresters were purely motivated by personal profits, that would be less of a problem if the outcomes were socially desirable. But their practices are not only influenced by self-interests.

A good example is when technocracy threatens to marginalize the forestry/conservation profession, yet foresters/conservationists keep on pursuing it. Calls to de-gazette reserves e.g. Maswa reserve[49] and accusations that actions of conservationists violate the rights of local people are getting louder with an increase in protected area conflicts.[50] As this member of parliament put it, "TFS came to Kaliua, they came to slash maize farms belonging to wananchi in my constituency. I ask today when we are hit by food shortage, TFS should be the first to respond and feed the wananchi of Kaliua. These crops were almost ripe, they come and put beacons inside of people's houses/homes. They (TFS) are incredibly unprofessional. All they know is to collect revenues without any concrete plans to rescue our forests. They just wait to mark timber with a hammer, issue transport permit, and collect revenues."[51] What this parliamentarian is implying is that all TFS is doing is apply conventional conservation approaches that are decontextualized and contributing to poverty. The argument here is not to deny foresters' rationality and conscious pursuit of self-interests but to argue that they are also partly predisposed to produce certain kind of practices even when doing so appears to render them irrelevant.

The following case further illuminate foresters' vulnerabilities, uncertainties and attempts to manufacture certainty, and forging of unlikely alliances (Mathews, 2005; Mathews, 2008; Mathews, 2009). The case relates to the dissimilar methods for determining timber volumes applied in VLFRs and general land. The approach has the effect of reducing demand for VLFR timber. On the face value, the case may appear as intentional pursuit of self-interests, which is partly the case. But a closer look reveal that it is also an example of symbolic violence, professional foresters furthering their domination without fully recognizing the effect of their practices.

Volume determination methods as it affects demand for VLFRs timber

In harvesting, determination of timber volume is important (1) to verify that only the amount specified in a license is harvested and (2) to establish the royalty. Different methods for volume determination are applied on general land and VLFRs. The Forest Regulations of 2002 requires measurement "in standing volume in the case of standing tree" (Section 4.1). The fourteenth schedule provides for royalties per cubic meter and recovery rates for converting logs and sawn timber volume to standing tree volume (**Error! Reference source not found.**). The interpretation of the law is such that it is standing tree volume that shall be sold and thus the forest manager must know how to measure it. It matters because log volume and standing tree volume are never the same.

There are three methods for obtaining standing tree volume depending on whether a tree is

measured before felling, before milling, or after milling. The first approach is to measure tree diameter at breast height and height before felling, then use the volume equations to obtain standing tree volume. The second approach is to compute standing tree volume from sawn timber and log volume using so-called recovery rates. The third approach is to use a conversion table for converting sawn timber into log volume and then into standing tree volume. The table i.e. *Table for the Conversion of Sawntimber to Roundwood Volume in cubic meter, all species except D. Melanoxylon,* is commonly used. The table is based on recovery rates of 31.6 – 32.6% (average 32.4 %) between logs and sawn timber. The recovery rates used in the table for converting sawn timber to roundwood volume (32.4%) is lower than the one in the Fourteenth Schedule i.e. 42.9 % (30 %/70 % = 42.9 %) (URT, 2016).

Table 10: Recovery Rates

S/N	Forest Produce	Recovery rate
1.	Round logs	70%
2.	Sleepers/square logs	60%
3.	Sawn timber, flooring strips and sandalwood chips	30%
4.	Mpingo products – carvings, clarinet sets	10%

Source: Forest Regulations (2002).

So, what is the problem? The standing tree volume rule is strictly enforced more in VLFRs than general land. This makes forest products from VLFRs systematically more expensive than general land. Further, even where standing tree volume rule is applied on general land, differential methods used to determine standing tree volume create an uneven playing field that leave VLFRs at substantial disadvantage. This matter remained 'unknown' until when it became noticeably difficult for villages with VLFRs to attract buyers. The matter came to light when timber traders who applied to harvest from VLFRs were surprised by what they were asked to pay (Interview #89).

An international technical adviser for a Finnish funded forest program in collaboration with local NGOs followed up on the matter. A report issued in early 2016 demonstrates how demand for timber in VLFRs is diminished by volume determination method (URT, 2016). **Error! Reference source not found.** summarizes the effect of using different methods, based on actual data collected in VLFRs in southern Tanzania. As shown in the table, using diameter at breast height produces higher standing tree than using recovery rates (row 1, bolded). In practice, state foresters almost exclusively use conversion tables to convert sawn timber volume to log (roundwood) volume mainly because it simplifies the task. Where buyers leave the forest with logs, the practice is government foresters estimate the number of sawn timber that can be obtained from the logs and

use conversion table to obtain roundwood (log) volume. They say through experience, this is a fairly straightforward thing to do. Timber buyers contest this practice as it may lead to overestimation of volumes and royalties (Field notes #86). Few foresters reported using recovery rates to obtain either log volume and/or standing tree volume.

Table 11: Illustration of Volumes Obtained using Different Methods

Data	Method for volume establishment	Log volume	Tree volume
Liwale - Mtawatawa VLFR: 47 trees, which gave 66 logs from which 532 planks were produced.	**1. Tree volume established through dbh measurement and FBD volume functions**		**210.9 m^3**
	Log volume established from tree volume (above) using log/tree recovery rates (log 70 % of tree)	147.6 m^3	
Volume of sawn timber = 18.78 m^3	2. Log volume established through actual measurement of logs	63.3 m^3	
	Tree volume established through measured log volume and log/tree recovery rate (log 70 % of tree)		90.4 m^3
	3. Log volume established from sawn timber volume and use of conversion table	60.0 m^3	
	Tree volume established through log volume (above) and log/tree recovery rate (log 70 % of tree)		85.7 m^3
	4. Both volumes established from sawn timber volume and use of standard tree/log/sawn timber recovery rates (Tree: 70 % logs, 30 % sawn timber)	43.8 m^3	62.6 m^3
Liwale - Kitogoro VLFR: 13 trees, which gave 24 logs from which 218 planks were produced.	**1. Tree volume established through DBH measurement and FBD volume functions**		**77 m^3**
	Log volume established from tree volume (above) using log/tree recovery rates (log 70 % of tree)	53.9 m^3	
Volume of sawn timber = 6.37 m^3	2. Log volume established through actual measurement of logs	22.9 m^3	
	Tree volume established through measured log volume and log/tree recovery rate (log 70 % of tree)		32.7 m^3
	3. Log volume established from sawn timber volume and use of conversion table	19.7 m^3	
	Tree volume established through log volume (above) and log/tree recovery rate (log 70 % of tree)		28.1 m^3
	4. Both volumes established from sawn timber volume and use of standard tree/log/sawn timber recovery rates (Tree: 70 % logs, 30 % sawn timber)	14.9 m^3	21.2 m^3

Source: URT (2016)

Villages managing VLFRs and who choose to measure trees before felling or logs before sawn are likely to struggle to attract buyers because their standing tree volumes are higher. In Machemba and Mtanza-Msona VLFRs, where they recently succeeded to find buyers, they measured diameter and marked trees before felling. This diameter was only used to determine whether a tree meet the minimum legal diameter for harvesting. Actual log volumes were used to determine royalties. In

Machemba village, two villagers (non-VNRC members) were chosen based on academic qualifications and received training in volume determination. The local NGO taught them a formula to compute log volume using log actual measurements[52,53] and thereafter standing tree volume using recovery rate of 70% (dividing total log volume by 0.7). They were certified by the local NGO as qualified assessors after passing an exam. The two trained villagers could describe the procedures for obtaining log volume, but they did not seem particularly conversant with the determination of standing tree volumes. In **Error! Reference source not found.**, if villagers sell actual log volume, buyers will pay for 63.3 m^3 in Mtawatawa and 22.9 m^3 in Kitogoro VLFRs. If they sell standing tree volume, buyers will pay for 90.4 m^3 and 32.7 m^3. All these volumes are higher than those obtained from sawn timber using conversion table and recovery rates.

Using data from **Error! Reference source not found.** (same number and size of trees), Table 12 shows the implication when VLFRs sell standing tree volume determined from actual log measurement and general land sell standing tree volume determined from sawn timber volume (URT, 2016). The royalty for class 1B species is Tanzanian shilling 204,800.00 per cubic meter.

Table 12: Difference in Revenue Emanating from using Different Volume Determination Methods

Timber trade in VLFR	Timber trade in General land	Comments
Mtawatawa VLFR:	General lands:	Difference: Tsh. 6,225,920
Tree volume: 90.4 m^3	Log volume: 60.0 m^3	**51 % more expensive buying from**
Price: Tsh. 18,513,920	Price: Tsh. 12,288,000	**VLFR**
Kitogoro VLFR	General lands:	Difference: Tsh. 2,662,400
Tree volume: 32.7 m^3	Log volume: 19.7 m^3	**66 % more expensive buying from**
Price: Tsh. 6,696,960	Price: Tsh. 4,034,560	**VLFR**

Notes: The same number and size of trees but different volumes and prices. VLFR sell tree volume obtained from actual log volume. General land sell log volume obtained from sawn timber. The difference is bigger when VLFR measure trees before felling and use volume function to obtain tree volume. Tsh. = Tanzania shilling. Source: **URT (2016)**

NGOs supporting PFM implementation in Tanzania organized a workshop in Lindi region to discuss the matter (Field notes #86). Participants to the workshop included timber traders, NGOs, villagers, central and local government. The issue was also high on the agenda at the workshop to conclude the Finnish support to the National Forest and Beekeeping Program (Field notes #87). NGOs and technical advisers expressed a concern that differential volume determination was threatening to erase the meagre PFM successes that have been achieved so far. They argued that this issue is a deal breaker as it creates disincentives for villages to manage forest through VLFRs.

Participants at the two workshops agreed that timber harvested in general land are determined through conversions of sawn timber to log volume using conversion table. Others (including timber buyers) confessed that the common practice has been not to compute standing tree volume

at all. Buyers pay for actual sawn timber or often log volumes (roundwood volumes) obtained using conversion table and to a small extent through recovery rates. Some even suggested that foresters have been benefiting from this practice. By not computing standing tree volumes, foresters create opportunities for themselves to extort money from buyers. Even after the arrival of TFS in 2011 with its alleged voracious appetite for revenues, volume determination did not attract attention because foresters are so used to using volume tables and thus not computing standing tree volume to the extent that it is mistaken for a legal practice.

The other issue that was noted at the workshops is the difference in level of supervision in VLFRs and general land. Since harvesting in general land is often unsupervised, there is no way to measure trees before felling or actual log volume if the buyer chooses to process the logs into sawn timber (pit sawing) before leaving the site. The unsupervised nature of harvesting on general land breeds excesses and is attractive to timber buyers especially because such excesses can be legalized retrospectively (Field notes #86). Buyers know unsupervised harvesting is against the law, but they say they do that as a favour to government foresters (*Ubinadamu*) – to save the few and overburdened foresters the hassle of accompanying buyers to the forests. They expect foresters to requite the favour especially when harvests exceed authorized volumes (*Ubinadamu*) (Field notes #86). Other than legalizing excesses and as shown above, buyers receive more favour by paying systematically lower than what they would pay if foresters were present on site.

On the contrary, villages exercise strict supervision of harvesting. They measure actual log volumes at landing sites before logs are converted to sawn timber. Members of VNRC are present to supervise harvesting to ensure that buyers are not harvesting more than the licensed amount. In Machemba village in Tunduru district, the buyer had a mobile sawmill on site and the committee members were always present. In Mtanza - Msona, the buyer was not present on site (Field notes #94). He hired villagers to do the actual harvesting. In both cases, logs were measured before being converted to lumber. Villages or specifically VNRC are stricter in applying the harvesting rules in VLFRs than professional foresters can achieve in general land.

Then, there is a question of recovery rates (**Error! Reference source not found.**). Where do they come from? Field level foresters using the recovery rates rarely ask themselves this question – they just use volume tables to determine royalties. At the workshop in Dar es Salaam to conclude a Finnish funded project, some of the TFS senior foresters based at the headquarters and who have been coordinating PFM processes from the beginning, revealed that the recovery rates originated from plantations of exotic species. The recovery rates were never meant for natural forests of native species (Field notes #87). It is thus misleading, they argued, to use the recovery rates for native species. In plantations, buyers pay for the whole tree and can take away everything,

including branches. Hence, the idea of selling standing tree volume. In natural forests, in many cases timber buyers only take away the merchantable parts and leave behind the rest. NGOs e.g. MCDI and timber traders are calling for VLFRs to charge actual to improve their competitiveness (Field notes #86). Yet, state foresters insist on the plantation forestry practice of selling standing tree volumes, which require recovery rates and had undesired effect of making VLFRs less competitive.

Participants at the workshops (non-TFS) blamed TFS appetite for revenues for the unfair competition. The argument is state foresters care more about revenue targets and less about management of VLFRs and forests on general land. NGOs, village leaders, and DFO share this position. This is undoubtedly part of the explanation. TFS foresters argue that most of its revenue collection comes from plantations of fast-growing species (**Error! Reference source not found.**). It does however set revenue targets for districts and zones without plantation of fast-growing exotic species, as we will see in the next sections.

Table 13: Proportion of Revenue by Source

S/N	Source	Proportion
1.	Plantation Forests	67%
2.	Non-plantation Forests	17%
3.	Registration, Licensing, Services	16%

Source: TFS presentation at the TT Workshop, Lindi & TFS (2014).

It is important to remember that the standing tree volume rule, recovery rates, and conversion tables existed even before the adoption of community-based forestry. It is something that state foresters have been applying in plantation forestry and natural forests of native species for years. State foresters transferred the practice to non-plantation forests, perhaps unthinkingly and now it is taken for granted that standing tree volume is sold. They did not do so with the intention of outcompeting VLFRs in the first place. These practices are specified in the regulations that were meant for government forest reserves and general land long before VLFRs and TFS came along. Even though these practices may now be deliberately used to outcompete VLFRs, that was not the original motive. Much as revenue targets and personal profits prevent state foresters from seeing the contradictions in applying standing tree volume rule in VLFRs, the lack of reflections about the rule and the recovery rates (taken for granted) is arguably more telling as to what makes the practice possible. It took an outsider to point out the flaws; for state foresters, they simply applied the conversion tables without questioning the practice.

In every instance, state foresters do not reflect on whether it makes sense to sell standing tree volume or use conversion tables. They just calculate volumes for the purpose of collecting royalty

without thinking much about the practice. It is true that bribe can make a forester refrain from calculating standing tree volume or from reflecting on the practice. Even in such a situation, a forester knows that a rule is violated and not because he has reflectively figured out that the rule is flawed. He is partly unintentionally taking actions to outcompete VLFRs. Practical difficulties of measuring trees before felling makes him estimate volumes from sawn timber. Most foresters were and are still unaware of the analysis presented in **Error! Reference source not found.** and are thus ignorant of the fact that starting with sawn timber produces systematically lower volumes. Before the international technical adviser cracked the numbers, nothing suggests that state foresters knew about it and they were deliberately keeping it secret. The adviser laboured to find out because he was concerned with the performance of community-based forestry. It is difficult to know if we would have learned about it if not for the decline in demand for forest products from VLFRs. Timber traders knew that they are less supervised and pay less when they harvest from general land. Still, it is unlikely that they knew that the culprit was the methods for determining standing tree volume. At the two workshops, no timber trader indicated knowledge of the different methods for determining volume. Everyone was used to conversion table (from sawn timber to round wood). What can be said with any certainty is that timber traders prefer general land because harvesting is unsupervised in most cases and the freedom accorded during harvesting means they can benefit more.

The practice of measuring volume of forest produce is an example of "paradoxical character of doxa enabling symbolic violence" (Bourdieu, 2001, p. 2). It is taken for granted that royalties must be based on volume measurements without much reflections as to what extent the measurements reflect realities. It is also taken for granted that villagers are incapable of finding alternative metric on which to base royalties and must therefore sell standing tree volume. Explaining the practice of requiring villagers to sell standing tree volume as one of the things foresters do intentionally to favour themselves is important. But it does not go as far as explaining why foresters ignore and/or are oblivious of the resultant unfairness (unless one is prepared to accept that foresters intend to harm and destroy VLFRs). This makes Bourdieusian explanation more plausible that the unfairness is invisible and/or imperceptible to foresters because to them it goes without saying that some standing tree volumes must be computed.

The explanation that foresters are behaving strategically to outcompete villagers only implores foresters' to even up a playing field and must also sell standing tree volume determined using the same methods as villagers. Alternatively, the explanation is only pointing villagers to also use recovery rates in determining standing tree volumes and beat state foresters in their own game. The explanation is insufficient to call foresters to regain cognitive consciousness about the basis

and consequences of their practices. The merit of Bourdieu's cultural theory of practice is that it allows for explanations that does not necessarily require framing the actors as criminals and that has the potential to transform the generative framework/grammar of unjust practices (Bourdieu, 1990). Symbolic violence is more difficult to address because professional/state foresters proceed believing that they are doing the appropriate and legitimate things. By using recovery rates to obtain standing tree volumes, state foresters believe that they are selling standing tree volumes. But in actual sense, they achieved to reinforce their domination through unreflective pursuit of standing tree volumes.

7.7 Practical limitations as a cause for violating the rules and not a sign of superficiality in belief in scientific forestry principles

At the workshop in Lindi (Participant observation #86), one thing was striking. Everyone was against TFS, which was forced to play defence for the entire workshop. As street level bureaucrats (Lipsky, 2010), DFOs are expected to team up with TFS foresters to defend the State's forestry practices. Instead, DFOs joined the opposing camp comprised of village leaders, NGOs, and timber traders to argue against some of the TFS' practices. Usually, DFOs are at loggerheads with villages and their NGO supporters. So, this alliance is unlikely and unexpected. Mathews (2009) describe similar unlikely alliances in which rural people of Mexico employ environmental degradation narratives of conservationists to oppose industrial logging. In our case, village leaders, NGO, and DFOs formed an unlikely alliance that painted TFS and its foresters as monsters who only care about revenues at the expense of sound forest management.

After the arrival of TFS, DFOs lost most of their responsibilities to the new agency. DFOs lost their status as secretary to the district harvesting committee as well as licensing and issuing of transit permit roles. DFOs' only hope of remaining relevant is VLFRs and Local Authority Forest Reserves (LAFRs). Most of the LAFRs have nothing much remaining for harvesting (Field notes #44). TFS and the minister responsible for natural resources succeeded to portray DFOs as being responsible for much of the forest destruction in the country. DFOs strategy now is to side with villages and NGOs to repel pressure from TFS. This camp asserts that TFS' voracious appetite for revenue is the cause for most of the troubles in forest management today. TFS foresters are accused of seeing trees for the revenues, which is arguably what DFOs did before the arrival of TFS. As a result, TFS foresters are sanctioning harvesting without plans, legalizing illegal timber and charcoal, and producing practices that undermines PFM policy (Field notes #86).

One issue often cited to illustrate TFS infamy is its instrumental use of the definition of general land. The definition of national forest reserves provided in the Forest Act includes forest reserves,

nature forest reserves, and forests on general land (Section 4a). The same Act includes general land in the definition of local authority forest reserves (Section 4b). So, both TFS and district councils can claim legal responsibility for forests on general land. But the TFS establishment order put the control of forests on general land under TFS. Notwithstanding, what constitute general land is equivocal and susceptible to manipulations.

Land Act and Village Land Act are legislations adjudicating land matters in Tanzania. The former defines general land *as all public land, which is neither reserved land nor village land and* ***it includes unoccupied or unused village land***. The latter defines general land as *land which is neither reserved nor village land but* ***does not include any of village land whether occupied or unused***. The Forest Act chooses to use the former. Before TFS, DFO applied this definition to issue licenses to harvest in village land. TFS foresters are doing the same. "Unused village land" implies un-surveyed village land and absence of village land use plan allocating village land to different uses. These framings of general land allow TFS foresters to access trees on non-reserved forests of village lands. One forester joked that if a general land is treeless, you can use the definition provided in the Village Land Act. For that reason, the framing could be something that might encourage villages to put more land under VLFRs. But as it is argued in the case report based on observations in Namatunu village (Sungusia & Lund, 2016), such framing discourages landscape level forest management. For fear of losing the land under VLFRs, villagers proceed cautiously in determining how much land to put under the reserve. The definition of general land employed by TFS strip villages of rights over unreserved trees. This creates perverse incentive for villagers to manage forests beyond VLFRs.

Table 14: Revenue Projection for TFS Eastern Zone

S/N	Forest Royalty	2015/2016
1	Forest Royalties from sale of Trees from non-plantation Forests	2,813,000,000.00
2	Forest Royalties from sale of Trees from Plantations	0.00
3	Forest Royalties from sale of Charcoal	7,566,000,000.00
4	Forest Royalties from sale of Fire woods	208,526,300.96
5	Forest Royalties from sale of poles from non-plantation Forests	118,543,700.00
6	Forest Royalties from sale of poles from Forest Plantations	0.00
	Total	**10,706,070,000.96**

Source: www.tfseasternzone.go.tz (Accessed January 1, 2016)

Harvesting in non-plantation national forest reserves is currently banned. It follows that TFS generates most of its non-plantation revenue from general land. Revenue targets are set in districts where no harvestable plantations of fast-growing species exist. **Error! Reference source not**

found. shows revenue targets for TFS Eastern zone by sources. These targets can only be met by harvesting of forests on general land as there is no harvestable plantation of fast-growing species in the zone. For this reason, DFOs, NGOs, and village leaders argue that TFS foresters are worried about losing control over forest and woodland on village land. A senior forester at TFS responded as follows to the question *why is TFS worried about losing control over general land while TFS still owns production forest reserves?*

> "Which forest reserves? There isn't much in productive forest reserves. General land is key to TFS. Tell me, where are these production natural forest reserves? You have studied literature already. And TFS is not even harvesting in forest reserves. TFS still needs general lands. It's about revenue my friend. That is where TFS makes its revenue." (Interview #142)

TFS is under pressure to generate revenues. Each zonal manager is given revenue targets to meet. At the same time, it is impractical to wait until all the forest reserves and general lands are measured and planned before harvesting can proceed. There is a need to generate money to cover for the cost of operations, including the cost of planning. Faced with this dilemma, it appears TFS chose to violate scientific forestry principles and sacrifice forests on general land for practical reason and not necessarily because of lack of faith in scientific forestry principles.

Forests on general land were sacrificed perhaps because they are considered of lower protection status. TFS has no mandate over general land (only trees on general land) and acting out of the fear that general land is disappearing, it is thus rushing to claim the trees on this land before it all ceases to be "unused" village land. It is also impractical for TFS to guarantee sound management of trees on general land given the nature of land tenure arrangement. For TFS reserving trees on general land for future use is not attractive because there is no way to guarantee that the tree will be there in the future. But it is more attractive for TFS to reserve trees in forest reserves because it owns the land and it is fairly practical to protect the trees on it.

This case illustrate how practical limitations can make foresters take short cuts and waive technical requirements. A haste conclusion would be foresters only care about their own and organizational profits. But the moratorium on harvesting in forest reserves and the wish to return to inventorying and management planning for forests on general land is a testimony that foresters do care about upholding scientific forestry principles too. The guilty conscience is yet another indication of the doxic thinking that inventories and technical management plans are indispensable for sustainable forest management.

7.8 Mtanza-Msona Inventories and Harvest Planning

International Technical Advisers (ITAs) contribute to the perpetuation of the unified forest management field - a field in which the emphasis on technical approaches is taken for granted. There are no shortage of cases illustrating this in the forest management field. We have already discussed the role of ITA in revealing the implication of using different volume determination method in section 7.6. ITAs are also instrumental in efforts to standardize inventory methods for VLFRs. ITAs are also influential in driving the sustainable charcoal idea piloted in Kilosa district. Below I offer a case illustrating the role of ITAs in reinforcing the propensity for technical practices in participatory forestry even where state foresters appear unable or unwilling to uphold the scientific forestry principles.

As in many other villages in the country that subscribed to CBFM, no harvesting took place in the Mtanza – Msona VLFRs between 1998 – 2012 under CBFM arrangement. Villagers had waited long enough, and they wanted to harvest in their forest. For that, an inventory-based harvesting plan was required. In 2013, the Rufiji district forest officer, working with the national technical advisor (Rantala, S., German, & A.) and with funding from the Belgian Technical Cooperation, carried out an inventory and prepared a harvesting plan for the 9,500 ha Mtanza-Msona VLFR. In that process, the DFO was guided by participatory forest resource assessment (PFRA), a government approved guidelines for assessing forest resources in VLFRs. He also received advice from NTA, a seasoned forester with experience of working for the government and NGOs. When this process was completed, the DFO had promised villagers that the next step was harvesting so that they can get to enjoy some rewards for their labour of looking after the forests.

But that did not happen. The harvesting plan was instead subjected to scrutiny within the project and the ministry. The ITA questioned the quality of the inventory, data analysis, and the harvesting plan. The senior foresters at the ministry confirmed ITA suspicions that the inventory and plan were of poor quality. The NTA objected arguing that the inventory adhered to government approved guidelines (PFRA) for undertaking forest resource assessment. PFRA require a minimum of 60 sampling plots for a forest bigger than 400 ha and the DFO delivered just that – 60 plots for 9,544 ha under Mtanza – Msona VLFRs. ITA argued that the number of plots cannot be fixed regardless of the size of the forests. Further, he argued that even with 60 plots, the analysis of data was below standard and that implementing the plan was tantamount to legitimizing over-harvesting. For refusing to soften his stance, the NTA was fired in the end. Afterwards, ITA determined that the district forest officer shall undergo training in forest inventory and harvesting planning before repeating the exercise. This appeared to ITA as natural thing to do because one of the project's targets is to build district/local capacities in forest management (Interview #66).

DFOs from eight other districts supported by the project attended the training. The training was

conducted by consultants. The same consultants carried out an inventory and harvest planning for Namatunu VLFR and in the process developed a blueprint for similar exercises in community owned forests (standardization). The training, as for the standardization, was commissioned through a Finnish funded project under the supervision of ITA. During the training workshop in September 2015, consultants reviewed the plans prepared by DFOs and agreed with the ITA assessment that if implemented, these plans were going to lead to over-harvesting. Consultants write in their report that "it was noted that the maximum sample size of 60 plots did not provide quality data for the preparation of the harvesting plan" and that most of the plans prepared by DFOs had "very big error margin" (Zahabu, Malimbwi, & Mugasha, 2015, p. 6). They recommended that DFOs should repeat the inventory using procedures and methods taught at the course and modelled after the Namatunu plan.

In the village, the last thing the villagers wanted to see was another round of inventory and harvest planning. As a result, DFO for Rufiji (supported by DFOs from other districts) was reluctant to accept the recommendation. He argued that the ITA ignorance of the local level politics was responsible the looming repeat of the inventory and harvest planning before any harvesting could be implemented. Other DFOs were worried that accepting the recommendation would be interpreted as if they are incompetent and squandered the money in their earlier attempts to produce the plans. But, since the ITA and consultants insisted, DFOs welcomed the idea with open hands seeing the prospects of boosting their income through allowances paid while on fieldwork. I asked a senior forester (he has been involved in coordinating PFM) at the forest service headquarters as to why ITAs and consultants are rejecting plans prepared as per PFRA guidelines. He thinks it's all ITAs and academics making;

> These people [academics, technical advisers] are trying to make PFM too academic. You know, these academics we seem to rely on now are the same people who got us here. They were involved in preparing most of the existing management plans for JFM/CBFM sites. The truth is we [state foresters] do not drive some of the things happening. The demand for the course you are talking about did not come from FBD/TFS. It came from the donor [ITA]. It wasn't even in the project budget but because advisers wanted it to happen, they found a way to pay for it. These donors [ITAs] are very clever. You will never know what they are after (Interview #81).

DFOs operating at the interface between the state and villagers and some senior foresters at the ministry did not approve of ITAs perfectionism. DFO prepared plans based on PFRA guidelines would have sailed through in the absence of ITAs. Harvesting would have taken place and it would have been declared sustainable for not exceeding levels specified in the plans. I know this because DFO for Rufiji had already promised harvesting in Mtanza – Msona VLFR. For many years, DFOs have been authorising harvesting in government-owned forests without any inventory,

management, and harvesting plan. All the back and forth was driven by ITAs who sought to make sure that CBFM is truly technical.

After the training, DFO had to juggle ITA requirements and villagers' frustrations of not being able to harvest due to the never-ending planning process. Village leaders even tried to resist a repeat inventory by arguing that the village assembly (the highest decision-making body at the village comprised of all the village members of the age 18 and above) objected to the idea. ITA was closely following up wanting to know about the arrangements for the repeat inventory. He followed up on such details as who was going to the field, when will the repeat inventory start, for how long, and who will be paid what (the activity budget). In the end, DFO had no choice but to convince the village leaders the repeat inventory was necessary and that after this round of planning, the next step would be harvesting. DFO was keen to spend as few days as possible in the field. Planning for the field work that I observed in Rufiji – determining sample size, number of transects, plot size, maps – was haphazard and only undertaken in the eleventh hour. It appeared as though the intention was simply to produce a document resembling the harvesting plan that would be approved by the consultants and ITAs. The revised harvesting plan was produced in August 2016. It was implemented before the completion of approval process.

The revised inventory and harvesting plan was subjected to the second round of scrutiny. ITAs sent the plan to the consultants for quality assurance who found shortcomings. The shortcomings were substantial to the point of necessitating a workshop involving DFOs and consultants for the purpose of jointly reviewing and addressing them. The plan prescribed that only 73 trees of mkuruti woods (*Baphia kirkii*) can be harvested amounting to 222 cubic meters per year. But villagers and participants to the workshop reported that 120 trees were harvested amounting to 240 cubic meters, generating Tsh. 72 million (Over US$35 000). Consultants disputed these numbers arguing that if 73 trees were supposed to produce 222 cubic meters, it's obvious that 120 trees would produce close to two times that volume. Academics agreed with the NTA attending the workshop that these numbers do not add up and it's an indication of irregularities and illegalities.

ITAs are genuinely pushing for a rigorous forest planning because they believe that is a key to sustainability. To them, *it goes without saying* that technical forest inventories are needed to professionally and sustainably manage forests. When I suggested to an ITA that privileging technical approaches in participatory forestry is counterproductive, he responded,

> So, the alternative is? We need to be practical. I work as a practitioner. I need a range of options to have an analysis. What are the other options available? I follow your principle but that fall in realm of the so called the anguish of the liberal mind. That the knowledge of the common guys is politically

> correct agenda…it is the agenda of political correction. That whatever comes from the grass root is rule. I think we need to be realistic here, okay? The villagers have never harvested at a scale they wish to harvest. Have the villagers ever harvested 8 000 ha of forests, extracting resources they wish to extract? Because that is what they want to do in a sustainable way. Has there been a body of knowledge, traditional knowledge about that? I don't know. I am not aware. I am asking the question in an open-ended way (Interview #66).

For the technical adviser, the suggestion that technical community forestry was somewhat counterproductive amounted to rejecting professionalism. To him, sustainable forest management can only be achieved through technical approaches to forest management. But in this case, it is more about the ITA and the academics sustaining their careers than the forests. Management plans are rarely followed in the few places where they do exist. And where they exist, they are of a poor quality – the ITA and consultants themselves have little confidence in existing plans. DFOs pretend to be managing forests professionally but, in reality, it is just hard to manage un-even, diverse, and chaotic natural forests of slow-growing native species. Historically, attempts to manage natural forests as per the ideal of scientific forestry have only produced imagined forestry – only existing in foresters' imaginations but never realised (Hansen & Lund, 2017). With the recognition that ideals of scientific forestry are often tempered by social, economic and ecological realities, scholars recommend a radical rethinking of the CBFM (Hansen & Lund, 2017; Larson & Ribot, 2007). By calibrating forest management approaches to local context would arguably make the ITAs, consultants and foresters more "relevant and useful to the people and forests they are supposed, and often seek, to serve" (Hansen & Lund, 2017).

DFOs, as other professional foresters, emphasize on technical approaches to forest management. But this becomes an endless process of getting the numbers right. For DFOs, inventories and forest management plans are just instruments for legitimizing harvesting. They realize that local social, political, and ecological complexities cannot be reduced to the ideals of scientific forestry but are unable to admit it publicly because that would (1) undermine their profession and (2) interrupt the income stream associated with donor-funded project. It's really a difficult task to walk and measure trees in 9 500 ha of dry miombo woodlands infested with dangerous wild animals. My interactions with foresters show that is not something they enjoy doing. Further, the government is not allocating any budget for forest inventories and management planning for VLFRs. Thus, the search for the right numbers is largely driven by ITAs with the help of aid money they control.

The argument advanced here is not that in absence of ITAs and donor-funded projects, the requirement for technical forest management plans for VLFRs would be waived. Rather, it is to suggest that in absence of ITAs and donor-funded projects, the requirement would largely remain on paper as it is the case for many forests on general land and government-owned forest reserves.

If access to VLFRs was only restricted on paper with no enforcement, the lived experiences would be such that there are no endless processes to get the numbers right. Further, if the requirement for detailed inventory and harvesting plan only remained on paper, Mtanza – Msona village could not have been made to wait for over 17 years to achieve a sale of timber in their forest.

7.9 Conclusion

This chapter analysed practices produced by foresters in Tanzania's forest management field. Practices are persistently framed in scientific forestry terms. Even as scientific forestry remains largely a wish – something that foresters aspire to do as opposed to what they are actually able to do, it is still taken as a golden standard for proper forest management. Generally, foresters focus less on the execution: they take it for granted (doxa) that forestry policy and plans must be scientific. Even when it repeatedly proves difficult to execute plans based on scientific forestry principles, policy and plans are not modified or changed in any fundamental ways. It is taken for granted (doxa) that scientific forestry is relevant and flawless. Foresters are noticeably unable to rethink the scientific forestry approaches even in the face of incompatible social, economic, and ecological realities.

We see that pursuit of self-interests cannot be ruled out as being responsible for preventing foresters from critically reflecting on their practices. Foresters and/or their organizations end up benefiting from the double standards in the enforcement of the requirement for technical management plan. They also end up benefiting from differential volume methods applied to general land and VLFRs, consciously or not. But that cannot be all, unless one is prepared to accept that foresters produce practices with the intention to harm villagers and the forests while pursuing self-interests.

The persistent refusal to embrace uncertainties – the miombo ecosystem is socially and ecologically too complex to practically simplify to the metrics of scientific forestry principles with any degree certainty - cannot be explained by intentional pursuit of self-interests only. Even when foresters are seen to violate scientific forestry principles and ignore certain realities (the act of ignoring is necessary for official knowledge to make sense), they do so largely due to practical limitations. Even when donors and ITAs step in to help, they often focus on few areas (rarely go beyond pilot projects) and use their massive resources to generate a parallel universe in which it is possible to strive for perfection (e.g. Mtanza – Msona case), all the while forests all over the country remain unmanaged. Foresters maintain the ambitions to return to the scientific forestry principles – what to them appears as naturally appropriate way of achieving sustainable forest management. To the foresters, social, economic, and ecological constraints are not a reason enough

to rethink the conventional forestry as applied to manage miombo woodlands. That is the case even when doing so make them vulnerable and at risk of being marginalized.

The persistence of technical approaches despite changing realities is caused by and a consequence of scientific forestry habitus created and perpetuated through forestry education, activities of forestry academics and participation in the forest management field. Scientific forestry culture i.e. the worldviews, perceptions, and concepts influence forestry practices, whether a forester is pursuing self-interest or not. Further, since practices are predicated on taken for granted assumptions, foresters misrecognize their pursuit for domination and undesired outcomes (including injustices) of their actions.

Chapter 8: Conclusions

Scientific forestry ideas and principles dominate Tanzania's forest management field. These ideas and principles persist whether the aim is to manage plantations of fast-growing exotic species or natural forests of slow growing native species. They also persist whether the approach is to centralize or decentralize forest management. Further, the scientific forestry ideas and principles persist even when non-implementation is commonplace and the expected and desired results are hard to come by. Supporters of scientific forestry brush off social and ecological challenges and blame poor implementation for undesirable results. While on the surface sustainable forest management is *the* fixed end goal and strategies to achieve it are altered over time, the style or ethos of action i.e. "the way action is organized" (Swidler, 1986, p. 276) remains largely unaltered. Practices in Tanzania's professional forest management field have been couched in scientific forestry terms continuously since these were introduced in the latter part of the 19th century. This raises a critical question - how are ideas about and authority of scientific/professional forestry reproduced in Tanzania's forest management field?

8.1 The Political Economy of Scientific Forestry Knowledge

The answer to the question posed above is partly political-economic. To be sure, professional foresters do produce strategic practices to support their individual goals (e.g. power, authority, money) as well as those of the organizations they represent. As discussed in chapter 7, the double standards common in Tanzania's forest management field bear the political-economic hallmark. In practice, harvesting from VLFRs is not allowed without detailed inventories, management plans, stricter supervision, and measurement of actual log volume for computing standing tree volume. But harvesting from forest on general land is allowed without any of these things. As a result, timber from VLFRs are systematically more expensive than those from general land, making the latter more attractive to buyers. The Rufiji district forest officer's insistence on obtaining a dedicated village hammer for marking logs and timber before allowing harvesting in VLFRs gave him a leverage to negotiate with communities and to regulate harvesting in the district.

The emphasis on technical practices in Tanzania's forest management field creates a demand for scientific forestry knowledge – the lingua franca to enable communication and set standards of practice in the field. For a forestry practice to be seen as meeting the standards, it shall involve inventory, management planning, demarcation, modelling and such other activities compatible with scientific forestry principles. These shape the production of scientific forestry knowledge by academics through research and consultancies to meet the demand and stay relevant. As described

in chapter 6, the questions and topics invoked in research and consultancies appear to follow, rather than precede and guide, policy choices and donors' funding priorities. The emphasis on technical practices also create demand for foresters who are well versed in the lingua franca of the field. Hence, the forestry education (curriculum and teaching methods) aims at creating such foresters. As described in chapter 5, the forestry curriculum is designed to preserve the primacy of scientific forestry knowledge. The pedagogy enables students to consume and absorb the primacy of scientific forestry knowledge. Ultimately, as Lave (2012b) observes, production, circulation, and application of scientific forestry knowledge is interconnected and affected by the same political-economic forces.

The role of end values in shaping practices cannot be ruled out. But the persistence of practices couched in scientific forestry principles defies this logic. If practices in Tanzania's forest management field were influenced by end values only, we would expect to see foresters altering their strategies in changing circumstances. Indeed, the ends and circumstances have been changing over time: timber production from plantations of exotic species to biodiversity conservation to timber production from natural forests of slow-growing native species, and increased participation of communities in forest management. But we actually observe the persistence of styles and strategies based on scientific forestry principles. This persistence cannot be explained simply by 'rational, interest-maximizing actor' model because the model would predict strategies to vary in accordance with changing circumstances and ends. Irrespective of whether the valued end is increased control over forests, increased timber production in plantations, increased timber production in natural forests, increased participation of villagers in forest management, or arresting a decline in forest cover, professional foresters invoke scientific forestry principles. In some cases, e.g. Namatunu case (Sungusia & Lund, 2016) and different methods producing different standing tree volumes described in chapter 6, this emphasis on scientific forestry runs the risk of exposing foresters' vulnerabilities and uncertainties rather than delivering more power and authority. To explain the persistence in forestry practices in the face of changing circumstances, this thesis turns to Bourdieu's concepts of habitus and doxa, which are consistent with what Swidler (1986) calls 'culture in action'.

8.2 Cultural Explanation of Practices in the Forest Management Field

Valued ends are important but not sufficient to explain persistence in scientific forestry practices. The role of culture is emphasized here because, generally, foresters do not stop at each instance to debate on whether to invoke scientific forestry claims or not; to them it goes without saying that scientific forestry principles shall prevail if sustainable forest management is to be achieved, valued ends or not.

Foresters appear to realize the limitations and practical challenges of applying scientific forestry knowledge in the management of natural forests. But this does not lead to a rethinking of scientific forestry. Rather, foresters call for its effective implementation and refinement. As described in chapters 6 and 7, the blocking system proposed for Namatunu VLFR was rendered impractical by the diverse and uneven distribution of slow growing species, uneven distribution of trees of harvestable size, and varying and unpredictable growth rates and natural processes. Yet, when this became obvious, foresters blamed poor implementation rather than question the relevance of scientific forestry ideals to the management of chaotic miombo woodlands.

Further, even when foresters are engaged in seemingly direct violence by forcefully evicting people settled in a forest reserve and other actions destroying local livelihoods, these actions appear legitimate to them because they have come to take it for granted that these human activities are incompatible with principled forest management. It is not uncommon, for example, to find a forester hailing from pastoral communities emphasizing on forest management actions threatening the very pastoral practices forming the basis of his people's livelihood. Nothing suggests that these actions are taken with the intention to punish the poor. They are taken because they are seen as appropriate and professional ways to protect and manage forests. The violence is thus symbolic – scientific forestry habitus and technical doxa naturalize practices and make foresters misrecognize the repressive nature of such practices. Naturalization is so complete to the extent that some forestry academics protested the use of the word 'violence' in my descriptions of forestry practices, arguing that it is wrong to suggest they are violent while all they do is to try and improve forest management.

I argue that what endures is scientific forestry habitus and doxa (cultural toolkit), the durable and transposable dispositions that enable production of technical practices consistently in different situations. As described in chapter 5, professional forestry training at SUA serves as the educative action supplying the educational capital (habitus) for the forest management field in Tanzania. The structure (the pedagogy) and contents of the forestry education provided at SUA imposes on students, particular ideas about and principles of forestry that are grounded on what I call scientific forestry. While in general students are readily amenable to acquire scientific forestry dispositions, equivalent entry students – those with prior forestry training and work experience – are less doubting than the direct entry students most of whom never aspired to study forestry at the university in the first place. Direct entry students thus acquire thinner layers of scientific forestry dispositions than the equivalent entry students. The mix of direct and equivalent entry students

facilitates acquisition of scientific forestry dispositions as the former provide assurances to sceptical students.

Nonetheless, the 'banking' education system dominates, and the scientific forestry ideas are deposited (by knowledgeable lecturers) in students' toolkits without possibilities for questioning or modifying them. Materials are delivered as solutions to the already known and unchanging problems; there is little focus on problem formulation. Forestry science and ecological theories are taught as 'scientific laws' that students must rote learn not only in order to pass examinations and graduate as foresters but also to make it into the forestry profession.

Forestry education is censored, consciously or unconsciously, especially on contrasting ideas. For example, the exclusion of insights from non-equilibrium ecology and compartmentalization by discipline through omission of social sciences and humanities from the forestry curriculum. These features of the forestry education at SUA enables students to acquire a set of dispositions that are congruent to the dominant assumptions and practices in the forest management field. I argue that forestry education at SUA, for these reasons, represent a form of symbolic violence, because it does not enable students to question the well-established knowledge in the field. Rather, it is designed to lock them into a set of ideas that allow perpetuation of the established scientific and social order in the field.

Forestry academics affirm their authority by doing research that matters. Thus, applied research is the order of the day – i.e. research commissioned by and/or paid for by the ultimate users of the produced knowledge. As described in chapter 6, research is more focused on finding solutions to problems defined by clients than on the formulation of problems. There is a notable absence of research critical of the established knowledge and ways of knowing. Scientific authority is based on the choice of topics to research. As an academic, choosing a topic of research on something not prioritized by funders and forestry bureaucrats is risking being rendered less influential. It follows that research questions with the potential of radically change the forest management field are unlikely to be asked. Further, research and other academics' activities, notably consultancies and recruitment of new academics, are part of the strategies (not in a conventional sense of conscious plan, rather a general way of acting) of conservation perpetuating the established scientific order (a la Bourdieu, 1975). Whether forestry academics are conscious about it or not, they perpetuate the established order by censoring out questions and epistemologies that might disrupt the prevailing scientific order.

In response to the conclusion that central tenets of scientific forestry are reproduced, academics have argued that ideas and thoughts in forestry have changed significantly over time. They often

cite participatory forestry as an example of a significant departure from past practices dominated by 'fences and fines' approach. It is true that participatory forestry amounts to significant shift in the relations between foresters and society. Hurst (2004) shows how early Tanzanian foresters were vehemently opposed to the idea of participatory forestry, arguing against the involvement in forest management of the very communities responsible for destroying the forests. Even with these changes, the dominant scientific forestry culture is still largely unchanged. The participatory forestry in Tanzania is still premised on the ideas of demarcation to separate people and forests, measurements, calculation of sustainable yields, and inventory-based management plans. This shows that foresters are still resisting ideas of local use and control over forests for thinking they are radical. But as Neumann (1998) shows in his book, the idea of establishing reserves that were off-limits to local people is relatively new and some British colonial foresters saw it as problematic and against human rights. Even though they lost the debate to conservationists in the end, colonial foresters sympathetic to Africans sought to preserve traditional rights to natural resources and allowed 'natives' access to reserves for hunting, grazing, and settlements.

So far, I have argued that Tanzania's forestry field is filled with assenters who are keen to reproduce the field. But the field is not without dissenters. As Garland (2006) observes in the wildlife management field, some foresters peddle the official narratives, although they are ambivalent about the relevance of scientific forestry principles. Dissenting voices can be heard in the forest management field and these come mostly from the few professionals who supported participatory forestry from the beginning. These voices are neither critical nor disapproving of scientific forestry per se but reflect reservation about some of the technical requirements in participatory forestry. The voices put the blame on experts and academics for replacing the simpler version of the CBFM guidelines with a more technical one. Dissenting voices doubt the practicality and contradictions of requiring villages to produce detailed inventories before they can be allowed to harvest in VLFRs by asking how poor villagers are expected to achieve it if the government itself is struggling to do it. Is it possible to achieve detailed inventories for all forests in Tanzania? The dissenting voices argue for simplicity because complexity is impractical and thus not a guarantee for sustainability. They call for only basic and as minimum as possible requirements to verify sustainability (see Ribot, 2002 for the discussion of environmental subsidiarity principles). The dissenting voices in Tanzania's forestry are not powerful and loud enough to revolutionize the field yet i.e. to create an environment where a radically new culture can develop.

In sum, even though practices in Tanzania's forest management field appear incoherent and contradictory, scientific forestry habitus and techno-bureaucratic doxa provide organizing structures. In the words of Ann Swidler (1986, p. 284), "they provide the ritual traditions that

regulate ordinary patterns of authority and cooperation, and they so define common sense that alternative ways of organizing action seem unimaginable, or at least implausible". For most foresters, it is unimaginable and implausible to rethink technical approaches even in the context of participatory forestry. This thesis does not suggest that the "costs of cultural retooling to adopt new patterns of action" will be small (Swidler, 1986). Rather, it is argued here that to achieve a more socially just forestry, i.e. to achieve meaningful change in the field beyond a mere replacement of one form of domination with another, usually associated with conventional policy dialogues, will require a focus on the habitus organizing foresters' practices.

8.3 Neoliberalism and the Reproduction of Existing Scientific Order

Recently, the emphasis on scientific forestry has been increasingly reinforced by neoliberal philosophies that have come to underpin environmental policies. Market-based instruments are increasingly chosen to address environmental problems and are seen as key to sustainability. Timber and other forest products, e.g. carbon, for which a market exists or can be created are thus elevated over local uses. Participatory forestry and REDD+ are predicated on the assumptions that income from the sale of timber and carbon respectively will incentivize local communities to manage forests as prescribed by experts. These neoliberal forestry policies demand the production of scientific forestry knowledge for natural forests – inventories, management planning, amount of carbon in trees, and calculation of deforestation rates. These policies demand simplification of complex social and ecological systems to create metrics that the market can comprehend. As described in chapter 6, the production of knowledge on miombo woodlands (volume and biomass modelling) picked up when market-driven policy targeted the materials i.e. timber and carbon that it can produce. It is not argued here that scientific forestry knowledge was not being produced before participatory forestry and REDD+ policies. Rather, the point is that neoliberal environmental policies have intensified the demand for technical knowledge and forestry academics are responding accordingly.

Donors and international technical advisers' favour neoliberal environmental policy and this is key for the introduction and successful implementation of these policies. Foresters take it for granted that market-driven models are the solution to many challenges facing forest management including inadequate funding. There is a consensus amongst foresters that forests were poorly managed because for a long time, the forestry department was seriously underfunded. As described in chapter 7, international technical advisers, armed with donor resources, play a pivotal role in translating neoliberal ideologies into policy, projects funded by donors and actual implementation. The Mtanza-Msona case shows that DFO appeared to lack means to effectively enforce scientific forestry principles and he was prepared to live with an inventory and plan that he thought was

good enough. But the international technical adviser insisted on and enabled a more rigorous inventory and planning. The Namatunu assignment meant to standardize inventory methods and harvesting in VLFRs is another good example of the role of donors and technical advisers in neoliberalizing the forest management field. Further, since forestry academics and foresters are likely to prioritize what is being funded, the space for producing alternative forms of knowledge is thus reduced.

Neoliberal philosophies help to reproduce the established scientific order in other important ways. The decline in public funding of higher education in Tanzania ushered in the reconfiguration of the public university in accordance with market needs i.e. "private leads the public" (Mamdani, 2007). This means creation of graduates who will serve as professional foresters and perform the official narratives and not challenge the dominant views in the forest management field. The curriculum is thus tailored to the market demands and to make students conform to the established scientific order that the market has approved. Further, commercialization tendencies of neoliberal science regime reinforce the preoccupation with applied research intended to produce policy recommendations and knowledge that can be commercialized. This is not necessarily a bad thing but "prioritization of knowledge produced to meet market needs at the expense of non-commercial research" is political and leaves the status quo unaltered (Lave, 2012c).

8.4 Theoretical contribution

The materials presented in this thesis contribute to the body of theories linking science and technology studies (STS) and political ecology traditions i.e. linking the politics of production, circulation and application of scientific knowledge (Forsyth, 2003; Goldman, Nadasdy, & Turner, 2011; Lave, 2012b). The production, circulation and application scientific forestry knowledge in participatory forestry is a case of power struggles in the forest management field. But as the thesis shows, this political economy reaches beyond the rational choice of topics and framing of research, and the instrumental use of scientific knowledge to gain more control over forests on village land.

By being able to produce and reproduce the habitus and thus subjectivities for the field, forestry scientists are able to reproduce their scientific authority by producing foresters who are most likely to demand for the scientific forestry knowledge that they are capable of producing. Scientific forestry habitus limits foresters into problematizing landscapes with trees in ways that naturalize solutions couched in scientific forestry terms. Forestry scientists, on other hand, have come to accept only particular epistemologies and pedagogies that elevate and reproduce the scientific forestry. As a result, scientific forestry is naturalized, and technical practices are taken for granted. Domination or rather violence is symbolic, misrecognized by both forestry scientists, professional

foresters and their subjects. This render production, circulation, and application of scientific forestry in Tanzania a case of symbolic violence. Ultimately, revolution of the Tanzania's forestry field is a much more difficult thing to achieve especially in absence of powerful disruptive external forces.

The materials presented in this thesis resonate with a case of politics of restoration science in the US stream restoration field described by Lave (2012b); (also see Zink, 2013). But unlike Lave's case in which a consultant (Rosgen) with little formal scientific training produced the habitus for the US stream restoration field, academics based at university are developing the habitus for Tanzania's forest management field. In Lave's case, federal and state agencies required the Rosgen restoration model, which compelled consultants and staff to attend Rosgen's courses. Universities, which sought to undermine Rosgen model as non-scientific in favour of complex scientific models which practitioners considered impractical, were thus unable to produce the habitus for the field. In our present case, forestry departments and donors require application of scientific forestry model of university academics. Further, there are no equivalent of Rosgen in Tanzania producing an alternative non-academic model.

The materials presented in this thesis challenge the notion of an autonomous scientific field. Forestry scientific field is hardly autonomous and what happens in the field is very much contingent upon what happens outside the field. Neoliberalization of environmental policy and higher education further bridge the scientific field producing scientific knowledge to politics happening outside of the field. While market – based solutions may be seen as efficient ways of addressing environmental and higher education problems, neoliberal philosophies create the demand for scientific forestry knowledge and graduates. Neoliberalization further erases the possibilities of reforming Tanzania's forest management field.

The forestry curriculum, pedagogy, and knowledge production described in this thesis are a case of scientific dependence in Africa (Hountondji, 1990). The basic tenets of scientific forestry e.g. measurements and demarcation and supporting ecological theories such as plant succession theories taught in forestry school were developed in contexts completely different from Tanzanian contexts. Tanzanian landscapes are teeming with trees, wildlife, and soils that are different from those in northcentral Europe where the ideas underpinning scientific forestry were developed. Tanzanian landscapes are also teeming with people who construct their livelihoods strategies based on resources available around them. In this case, the separation of people and forests is an act of violence and it will almost certainly be met with some form of resistance. This was the case in England in 18th century when the separation introduced to afford the privileged classes exclusive

access to the forests was fiercely resisted (see Thompson, 2015). The transplantation of the separation to Tanzania during the colonial period involved lots of hesitation and negotiation (see Neumann, 1998) which has, however, all but vanished today while the resistance locally remains.

Using perceptions, concepts, and solutions originating from the North to order Tanzanian landscapes amount to epistemic violence. This is not to dismiss efforts that have been made to adapt imported scientific forestry knowledge to Tanzanian landscapes dominated by miombo woodlands. The argument is, in thinking about Tanzania landscapes and miombo woodlands, the starting point has always been imported scientific knowledge. The starting point is often not the understanding of the landscapes complete with its complexities and building concepts and ideas specific to these contexts.

This thesis is not arguing that Tanzanian forestry scientists operate at the peripheries of science (Zink, 2013). Even though somewhat disadvantaged, the forestry scientists in Tanzania are very much integrated in the global scientific community. They often partner with scientists from the North, who have more access to research funding, to implement research projects. These projects are often conceived and designed by researchers in the North. Further, since resources for basic research are limited, forestry scientists rarely theorize – they apply theories originating from elsewhere to undertake applied research. As Hountondji (1990) points out, forestry scientists in Tanzania take this situation for granted and accept that they operate at "the margins of science". The acts of imitating science developed in the north amount to scientific dependence and question the relevance of African universities to African development. The dependence is further reinforced by meagre budget allocations to research by African states and processes of internationalization of higher education e.g. pressure to publish in internationally recognized peer-reviewed journals (Adriansen, Madsen, & Jensen, 2015).

This thesis also speaks to post-colonial studies that attempt to make sense of how African institutions are still a colonial legacy five decades after independence (see Mamdani, 1997). Scientific forestry was introduced in Tanzania by colonial foresters mainly for the purpose of facilitating the colonial project of resource exploitation and domination. From the beginning, the application of scientific forestry was based on undermining local forest uses in favour of products prioritized by outsiders, mainly timber (Sunseri, 2009). Even though a lot has changed in the ways scientific forestry is deployed and what it seeks to achieve, it still today seeks to relegate local uses of forest to the lower division. Forestry curriculum prioritizing timber and carbon while undermining local uses forest and pedagogy discouraging students to question the monopoly of scientific forestry is a colonized curriculum and pedagogy. Colonial administrators employed

these strategies to create 'educated labourers' who supported colonial projects (see Zink, 2013). Forestry training institutions such as FTI OlMotonyi were started to train forestry technicians to support colonial projects. As Ngugi wa Thiong'o (1986) puts it, true independence will come from decolonization of the minds. Decolonization of forestry would require decolonization of the curriculum.

8.5Recommendations

This thesis may seem at first glance as a mere critique of professional foresters, forestry academics, and the forestry profession as it is currently practiced in Tanzania. To be sure, the aim is not to condemn, rather to make contributions to the improvements of forestry practices. The thesis calls for a radical re-thinking of scientific forestry as applied in the management of natural forests. Foresters might ask for specific recommendations on what such alternatives to scientific forestry might look like. But that is beside the point of this thesis, which is to draw attention to the reproduction of scientific forestry in order to inspire the rethinking. The aim was never to prescribe an alternative to scientific forestry but rather to define conditions that might give rise to something challenging the prevailing forestry orthodoxy.

Scholars who have examined the distance between theory and practice vis-à-vis outcomes have called for a rethinking of the technical framing of participatory forestry (FAO, 2004, 2016; Hansen & Lund, 2017; Larson & Ribot, 2007). While this call is warranted, it is mostly based on the vision of government foresters as engaged in intentional tactics of holding on to power and control over forests. This view misreads the deeper roots of foresters' propensity for technical/scientific forestry practices. As a result, the call to radically rethink the forest policy has largely been ignored by policy makers and/or responded to with minor refinements.

As this thesis concludes, in producing practices, foresters use cultural equipment (habitus) they have access to. Thus, to achieve a more meaningful rethinking, the thing that needs to be transformed is the scientific forestry habitus, and the culture of symbolic violence it nurtures. These deep-seated changes are likely to incite reactions not only from those occupying the dominant positions within the forest management field but from the institutions of the state in general.

This thesis argues that a meaningful and radical (focusing on the most basic and important parts) rethinking of forest policy will come from a radical rearrangement (if not complete replacement) of the habitus that foresters use to construct practices. It requires the production of a different habitus, one that is more encompassing, and accommodates multiple ways of knowing and

knowledge. The radical rethinking of forest policy requires cultivation of habitus/culture that allows for critical reflections and that ensures high coherence and consistency between 'intervention' and desired outcomes by constantly subjecting interventions to scrutiny. As it has been argued throughout this thesis, forestry education is the process tooling up the toolkit that foresters use to construct practices. Thus, a call for radical rethinking of forest policy is a call for radical thinking of forestry curriculum and pedagogy. Here are some possible ways forward:

(a) Rather than emphasizing on just the acquisition of knowledge (Freire, 2000), the forestry pedagogy should emphasize on questioning and formulation of problems. Forestry curriculum should focus on the limitations of the existing body of knowledge and illuminate rather than obscure the unknowns.
(b) Forestry curriculum should be changed to reflect the existing socio-ecological contexts. This is not a call for replacement of the Western science. It is rather a question of relevancy of forestry knowledge and the ability of graduates to understand and solve problems.
(c) It is important for the forestry curriculum to blur disciplinary boundaries and incorporate social sciences and humanities. This is particularly important because forest management, especially management of natural forests, touches the interactions between people and trees. In an old and oft-cited quote, Jack Westoby is making a case for social forestry by arguing "forestry is not about trees, it is about people. And it is about trees only insofar as trees can serve the needs of people" (Hobley, 2005).[54] As Bennett et al. (2017, p. 93) argue, social sciences and humanities can improve on the diagnostic and reflexive value of forestry education and science, and thus "facilitate conservation policies, actions, and outcomes that are more legitimate, salient, robust and effective". Social sciences and humanities thus have the potential of improving the relevance of not only scientific forestry knowledge but also of foresters themselves.

The recommendations provided here do not promise to be easy to implement. The limitation is likely to come from the oppressive forestry pedagogy with its depoliticizing and disciplining effects as it prevents foresters and forestry academics from seeing the value of embracing diversity in knowledge production. Further, since these recommendations challenge the established scientific order and the power it bestows to the state, the state will likely resist. Nonetheless, it is expected that this thesis will generate the debate and dialogue needed to achieve a meaningfully rethinking of forestry policy and practices.

NOTES

[1] The Village Land Act, 1999; The Local Government Act, 1982; The Forest Act, 2002.
[2] Forest Act, 2002, stipulates, "a declared village land forest reserve shall be managed in accordance with the village land forest management plan (Section 34(4b)). The forest management plan shall contain "provisions regulating the commercial exploitation of the resources of the forest including any provisions regarding afforestation and reforestation" (Section 11(h)) and "proposals for the zoning of the forest to facilitate the use of specific parts of the forest" (Section 11(j)).
[3] Minutes for SCIFOR project launching stakeholders workshop, June 2015.
[4] The problem of weak implementation is not unique to VLFRs. It is also a problem with community-managed wildlife management areas (WMAs), government forest reserves and game reserves.
[5] The argument put forward in defence of this weakness is that earlier plans prepared as per PFRA were conservation focused and were never intended to guide harvesting.
[6] State is here taken to mean "an X (an entity, a government, its department, its officials etc.) which successfully claims the monopoly of the legitimate use of physical and symbolic violence over a definite territory and over the corresponding population" (Bourdieu, Wacquant, & Farage, 1994).
[7] Culture as defined by Swidler (1986, p. 273) means "symbolic vehicles of meaning, including beliefs, ritual practices, art forms, and ceremonies, as well as informal cultural practices such as language, gossip, stories, and rituals of daily life. These symbolic forms are the means through which social processes of sharing modes of behavior and outlook within community take place. Technology, artifacts, everything that one would need to know to become a functioning member of society. The publicly available symbolic forms through which people experience and express meaning".
[8] Pathisa Nyathi was interviewed by Zeinab Bedawi as part of BBC's History of Africa documentary series. http://www.bbc.co.uk/programmes/p057yg4c (Accessed 25 September 2017)
[9] http://www.suanet.ac.tz/index.php/education/entry-requirements?id=426 (Accessed 1 December 2016)
[10] College of Agricultural Sciences and Fisheries Technology offer programs such as BSc Agricultural Economics; Crop Science and Technology; Food Science and Technology; Animal Sciences; Veterinary Medicine traditionally offered by SUA. http://www.coasft.udsm.ac.tz/dep.php (Visited on 4 February 2017, 14:21 East African Time).
[11] http://www.mpingoconservation.org/community-forestry/where-we-work/rufiji/
[12] World Bank (2010). TFCMP Implementation Completion and Results Report.
[13] http://www.qsrinternational.com/nvivo/nvivo-products
[14] For detailed treatment of the history of scientific forestry and how it travelled to the rest of the world and to Tanzania, see (Hurst, 2004; Schabel, 1990); Scott (1998); (Sunseri, 2009; Vandergeest & Peluso, 2006a, 2006b).
[15] This is the risk of committing type I error (false positive) – wrongly or unnecessarily accepting hypothesis blaming villagers for deforestation and forest degradation. Usually, foresters and environmentalists fear committing type II error (false negative) – wrongly absolving villagers of responsibilities for deforestation and forest degradation.
[16] Schons (2011). Henry Chandler Cowles: Ecologist, Educator, and Conservationist. *National Geographic Education*. http://education.nationalgeographic.org/news/henry-chandler-cowles/ (Accessed on 12 April 2016 18:55 GMT).
[17] http://www.tcu.go.tz/images/documents/AdmiSsion_Procedures.pdf
[18] http://www.nytimes.com/2015/08/24/opinion/the-case-for-teaching-ignorance.html
[19] https://jimsligh.wordpress.com/2013/08/05/tigritude/ (Visited 22 Feb 2017, 21:21 East African Time)
[20] https://www.pambazuka.org/resources/importance-research-university (Visited on 19 Jan 2017, 16:16 EAT).
[21] https://clarivate.com/essays/impact-factor/ (Visited on 16 October 2017, 17:08 EAT).
[22] http://www.sciencemag.org/news/2016/07/hate-journal-impact-factors-new-study-gives-you-one-more-reason (Visited on 19 October 2017, 17:20 EAT).
[23] http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2028 (Visited on 16 October 2017, 18:05 EAT).
[24] http://www.sjsu.edu/people/fred.prochaska/courses/ScWk170/s0/Basic-vs.-Applied-Research.pdf
[25] https://www.pambazuka.org/resources/importance-research-university (Visited on 19 Jan 2017, 16:16 EAT).
[26] Paradigm as defined by Kuhn as a period of normal science (See Endnote 32).
[27] Perhaps in an attempt to represent their ideas as new (and innovative) and thus have little to do with history, some academics chose to criticize the use of this quote arguing that it is old and that people behind these quotes are no longer part of the current and dominant thinking in forestry. As this thesis show, most of the practices in forestry today are a legacy old ideas and thoughts, some dating back to colonial times.
[28] '*Normal science* is the science done when members of a field share a recognition of key past achievements in their field, beliefs about which theories are right, an understanding of important problems of the field, and methods for solving those problems' (Sismondo, 2010:12, emphasis in original).
[29] One paper contained the following recommendation: "The current efforts of the government to increase access to formal education at primary and secondary level is a good move in improving the technological understanding of villagers. However, because the education is general and does not cater for specifics of forest management, issues related to forest management have to be more emphasized in the curriculum. Furthermore, the government has to make efforts to reduce dependence on forest resources for livelihoods, which results in overexploitation of forests and depletion of forest resources. Villages have to be surveyed and documented and facilitated to prepare land use plans".
[30] http://www.cifor.org/miombo/project.htm

[31] http://www.metla.fi/julkaisut/workingpapers/2007/mwp050-17.pdf
[32] CCIAM – Climate Change Impact, Adaptation and Mitigation (https://www.nmbu.no/en/faculty/landsam/department/noragric/institutional_coop/climate-change-impacts-adaptation-and-mitigation-cciam-programme-in-tanzania). The programme focused on promoting natural forest conservation, afforestation, reforestation and better agricultural practices for improved livelihoods related to the "Reduced Emissions from Deforestations and Forest Degradation (REDD)" initiative.
[33] Bourdieu (1975) argues that in a scientific field with established scientific order, the consensus in scientific methods means that the field tend to 'only solve the problems it can raise and only raises the problems it can solve' (31). In other words, actors in an established field cannot raise unknown questions – those that challenges the very foundation and functioning of the field. They only raise questions based on existing knowledge and what they intend to achieve with answers to those questions, which amounts to maintaining the established scientific order.
[34] http://www.forconsultsua.suanet.ac.tz/index.php/about-us
[35] FORCONSULT Profile (2017)
[36] https://www.pambazuka.org/resources/importance-research-university (Visited on 19 Jan 2017, 16:16 EAT).
[37] Ai Weiwei (2017). How Censorship Works. The New York Times, 6 May 2017. https://www.nytimes.com/2017/05/06/opinion/sunday/ai-weiwei-how-censorship-works.html (Accessed 6 May 2017, 16:45 East African Time).
[38] http://soundandfair.org/
[39] Framing refers to the perception or evaluation of environmental change - the principles and assumptions underlying the perception or evaluation of environmental change/problem (Forsyth, 2003).
[40] I use the word 'policy' in its broadest sense to refer not only to policy document but also laws, Acts, regulations, guidelines and order.
[41] http://wwf.panda.org/about_our_earth/ecoregions/eastafrica_coastal_forests.cfm
[42] Section 7 of the Forest Regulations, 2004. See also Guidelines for harvesting in VLFRs. DFOs were already in possession of a hammer, long before PFM. For PFM purposes, the law requires a hammer specific for marking logs and stumps in VLFRs.
[43] Ikwiriri is a village-cum-small town in Rufiji located along the Dar es Salaam – Kilwa - Lindi – Mtwara highway just before the Rufiji river and about six kilometers from Nyamwage and Tawi villages. It's a major timber trading centre. There are about 10 primary wood-based industries (saw mills) and about 500 secondary wood industries in Ikwiriri (Per. Comm., Balama Chelestino, 7 April 2017).
[44] The efforts included reporting the matter in high level forums organized in collaboration with donor countries such as Decision Makers Forest Academy - high level decision makers, opinion leaders, politicians and other key forestry stakeholders – organized by the Uongozi (Leadership) Institute with funding from Finland, a major donor to PFM activities. http://www.mpingoconservation.org/about-us/news/detail/news/hammering-down-on-illegal-logging/?tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&cHash=5a947df11e327a893040101f20e46e34
[45] Sharon Daniel writes the "The trick to the public secret is in knowing what not to know. This is the most powerful form of social knowledge. Such shared secrets sustain social and political institutions." http://www.intelligentagent.com/archive/Vol6_No2_community_domain_daniel.htm
[46] This claim was regularly uttered to me by another academic who I regularly conversed with on matters related to scientific forestry and participatory forestry. He is affirmatively and decisively against PFM and the idea of involving communities in forest management. He argues that all over the world, forest management is a task of the state. You can't ask hungry people to look after the resource. That participatory forestry in Tanzania was a project of a foreign lady and who is not even a forester. There are fears mostly amongst the NGO staff that TFS is taking anti-PFM stance. The fear was exacerbated when the Minister declared in February 2018, the government intention to confiscate forests on village land and under the district councils for these entities have failed to ensure proper management of the forests (https://wizarayamaliasilinautalii.blogspot.com/2018/02/katika-kipindi-cha-uongozi-wangu.html , Accessed 12 February 2018, 11:40)
[47] Daniel Nsanzugwanko, Parliament of Tanzania, Hansard, 24 May 2016, Third Meeting, 27th Session
[48] https://www.youtube.com/watch?v=Q8i5vF5xLKY
[49]http://www.parliament.go.tz/supplementary_questions/303/1034/read
[50] http://www.jamhurimedia.co.tz/mbunge-jangili/ & http://www.jamhurimedia.co.tz/taarifa-kamili-ya-kamati-ya-lembeli-iliyowangoa-mawaziri-wanne-wa-jk/
[51] http://bunge.go.tz/index.php/contributions/440. Ms. Magdalena Sakaya, Member of Parliament for Kaliua Constituent contributing to the Ministry of Natural Resources and Tourism budget 2016/2017.
[52] The formula used to obtain actual log volume in cubic meters is [Length (cm)*Circumference (cm)]/12560000.
[53] MCDI describe the harvesting procedure as follows: "In accordance with Tanzanian law, the timber buyer must arrange for each log to be stamped by a District Forest Officer before they can be transported within the country. This must take place at the location where each tree was felled. Each felled log should be measured at the landing site, the volumes calculated, and log statements maintained." http://www.mpingoconservation.org/sustainable-timber/buy-timber/harvesting-procedures/ (Visited 5 February 2018, 14:10 GMT).
[54] Also see http://www.fao.org/asiapacific/representative/speeches/detail/en/c/64/ (Visited 23/11/2017, 19:00 EAT).

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