The challenges of adopting afforestation as an alternative and sustainable land use for economic development

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Abstract

Afforestation is an important aspect of silviculture whereas, globally its broad adoption as an alternative land use option for economic development is still a dream away. Many countries across the globe have `bad land' and `underutilised land' which could be considered for afforestation as one land use option with great economic potential. Despite the growing significance of afforestation in the development discourse world-wide, its uptake by farmers as an economic activity of tremendous ecosystem value and services remains a peripheral consideration. Hence based on a critical qualitative content analysis of literature reviewed for a Doctor of Philosophy thesis, this paper explores the challenges behind the dispirited adoption of afforestation globally, as an alternative land use option for economic development. Results of the content analysis point to the economic value of afforestation not being fully exploited due to the farmers' ignorance of the benefits of afforestation, anachronistic cultural attitudes, institutional and capacity challenges, lack of education and training, aversion to long term investment, ignorance of existence of funding partners in afforestation, lack of adequate extension services, insecure land tenure arrangements for forest land and wildlife menace. Out of these challenges, a close analysis point to primarily three challenges being of critical importance to deal with in order for humanity to trigger a world-wide adoption of afforestation as an alternative land use for economic development. These are security of tenure on forest land, access to extension services and access to capital.

Keywords: Afforestation; sustainable land use, ecosystem and economic development.

Introduction

Many countries across the globe have actively sought to promote afforestation as an alternative land use for economic development through state policy and support (Ryan, 2016; Lovell et al., 2017; Minang et al., 2018; Dupraz et al., 2019). However, the fly in the ointment has been the successive failure of these initiatives to achieve set policy targets (Eurostat, 2013; Ryan, 2016). Past and present institutions of management have failed to provide lasting solutions in the management of afforestation as an alternative land use for economic development (Gwaze & Marunda, 2014; Nyikadzino, 2016; Matsvange et al., 2016; Matsvange et al., 2016). However, despite the continued failure of many of the afforestation initiatives (Eurostat, 2013; Ryan, 2016; Dupraz et al., 2019), it is noteworthy that the world at large still regards afforestation as a viable land use option for economic development. To date, a plethora of studies on afforestation have been done (Ryan, 2016; Lovell et al., 2017; Tian et al., Sohngen et al., 2018; Dupraz et al., 2019) However, none of the studies zeroed in on establishing the challenges of adopting afforestation as an alternative land use for economic development.

In order to have an appreciation of the need to isolate challenges of adopting afforestation as an alternative land use for the purpose of charting a way forward around them, we need to take a brief look at the state of forest cover in the six (6) geographical regions of the World.

Fig. 1: Forest cover across the World from 1990-2010

Region	Total forest cover (in MHa)			Change (in N
	1990	2000	2010	
Africa	749	709	674	−75
Asia	576	570	593	17
Europe	989	998	1005	16
North and Central America	708	705	705	−3
Oceania	199	198	191	−8
South America	946	904	864	−82
World	4168	4085	4033	−135

Source: http://www.earth-policy.org/indicators/C56/forests_2012 (Accessed 19.03.2015).

The table above indicates that forest cover has been declining in many regions in a 20-year period of 1990-2020. Out of the 6 regions, only Asia and Europe experienced an increase in forest cover. The rest of the regions were in a loss bracket. Noteworthy is that South America led in loss of forest cover, followed by Africa as a region. Cumulatively 135 million hactares were lost across the world in that 20-year period. This gloomy picture will continue unless the forest cover lost is replaced through afforestation or reforestation initiatives. Fig.2 tells a story of forest expansion being pitted against deforestation. In that narrative, forest expansion is outpaced by de-forestation activities globally. Except for the period of 2000-2010, the remaining three periods (1990-2000; 2010-2015 & 2015-2020) lose to deforestation by almost 50% with 2010-2015 even registering loss of more than 50%. The picture of sustained loss of forest cover to de-forestation points to humankind marching gradually towards

desertification if an appropriate intervention such as afforestation or re-forestation is not undertaken.

Fig. 2: Global forest expansion and de-forestation.
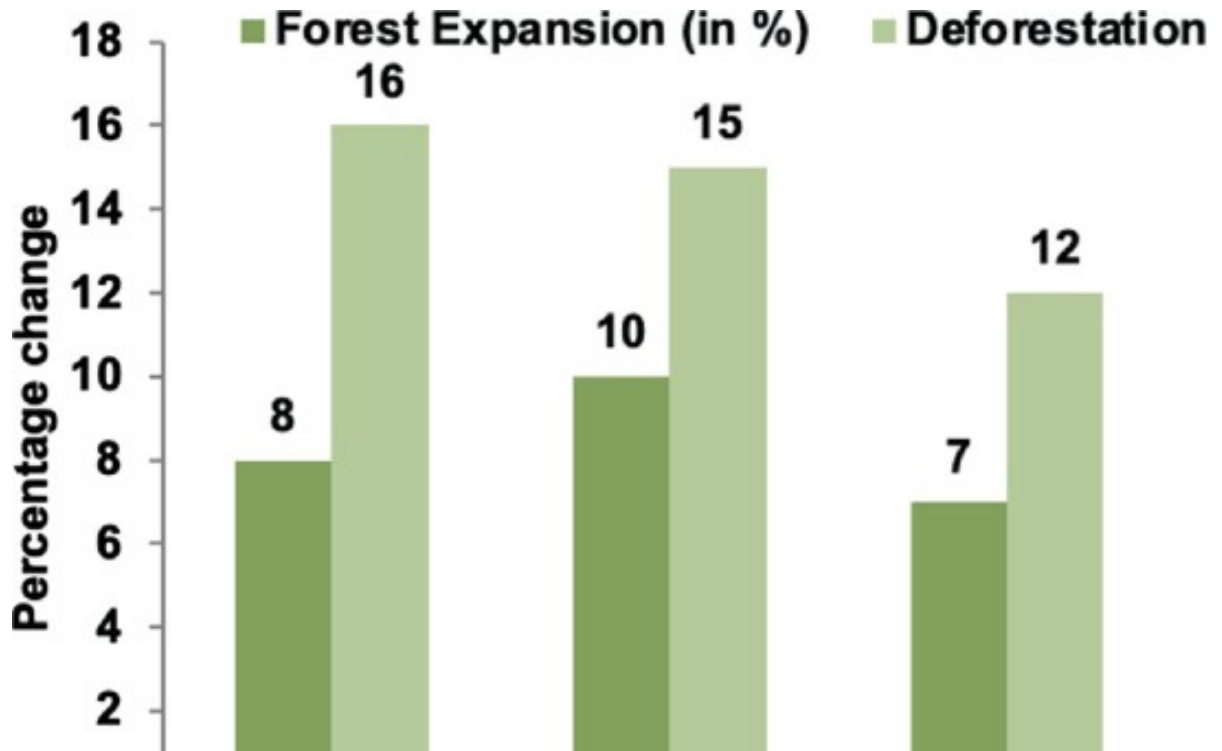
Source: UN Food and Agriculture Organisation 2020.

The results of the three-decade scan presented below indicate a precipitous downward course of forest area lost from 1990 to 2020. In sum, in as far as area under forest is concerned the world continues to live in a deficit. This scenario calls for a world-wide adoption of afforestation as a land use option to ensure humanity's sustainable access to forest-based ecosystem services. Nevertheless, unless challenges to adoption of afforestation as land use option are isolated it will be very difficult for humanity to stem the tide of calamitous de-forestation.

Fig. 3: Average area of forest lost each year by decade

The world's forests are still decreasing in siz

Average area of forest lost each year by decade (hectares)

7.8m

5.2m

4.7m

6m

4m

2m

0m

1990–2000

2000–2010

2010–2020
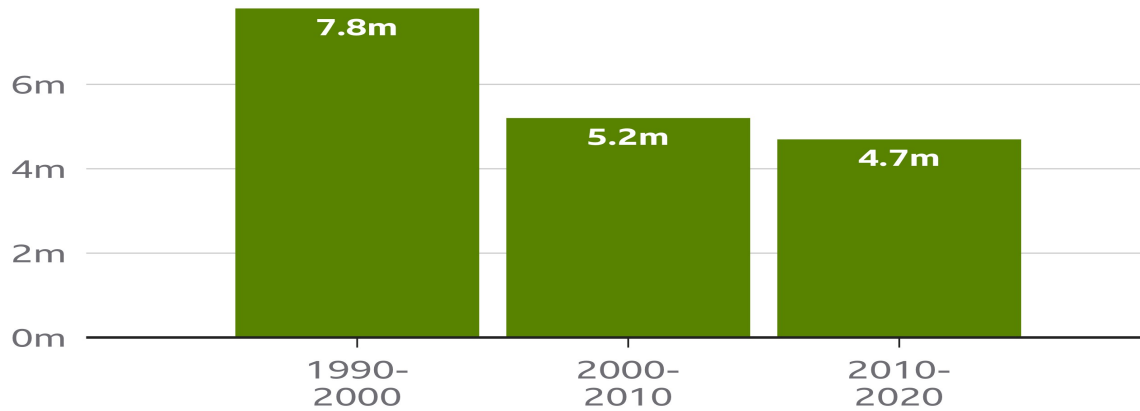
Figures are for net change in area

Source: UN Food and Agriculture Organisation, 2020

B|B

BACKGROUND TO THE STUDY

Forests have been important to most human societies since time immemorial. They contribute to the livelihoods of many of the 1.2 billion people living in extreme poverty (Bala et al., 2007). Forests provide products of both social and economic value (see FAO, 2015). Forests provide global food security and resources, food, fodder, fuel and medicine. Forests have always been an indispensable asset to most global societies since time immemorial (Ryan, 2016; Lovell et al., 2017; Tian, Sohngen, Baker, Ohrel, & Fawcett., 2018; Minang et al., 2018; Dupraz et al., 2019). However, the economic value of supporting and regulating these services provided by forests is not well-captured in the market and therefore always undervalued. However, despite these potential benefits, the expose on the use of afforestation as an alternative land use for economic development has remained on the periphery of studies (Kanowski, 2010), However, despite this global hype, current afforestation

management frameworks seem to have failed to achieve set targets (see Ryan, 2016; Dupraz et al., 2019).

Afforestation programmes have been initiated in several regions as alternative land use for economic development. However, the success of existing institutions of management frameworks in afforestation have been widely questioned (see Ryan, 2016; Lovell et al., 2017; Tian, Sohngen, Baker, Ohrel, & Fawcett., 2018; Dupraz et al., 2019). In most of the regions, current frameworks for afforestation management seem to have failed as output has fallen well short of policy targets (see Ryan, 2016; Dupraz et al., 2019).

Insights from extant literature highlight that afforestation is increasingly valued for its potential to enhance ecosystem services and is being actively promoted in many countries through state policy and support (Kanowski, 2010). Similar to many countries, Zimbabwe has sought to increase forest cover for some time (Nyikadzino, 2016; CIFOR, 2014; Gwaze & Marunda, 2014). However, the economic incentivisation has mostly been absent in most of these initiatives. Such a scenario poses a challenge for land use allocation and modelling land use change. In the past, however, trial and error or rough rules of the thumb were adequate means of determining which land to use and how (FAO, 2015).

In the context of overall forest cover, the conversion of land from agriculture to forest is unusual in the global context (Ryan, 2016). Despite the lure of financial incentivisation from afforestation (see Hull et al., 2016; Minang et al., 2018), a lot of land globally remains either idle or underutilised.

In Zimbabwe, many afforestation programmes initiated to address the problem of agriculturally unproductive land have stumbled along and eventually faded away (CIFOR, 2014; Gwaze & Marunda, 2014; Marufu, 2014; Nyikadzino,

2016). Generally, the decline in afforestation has consequences for downstream industries such as timber processing (Wilson, 2016; Ryan, 2016). Though pockets of research are beginning to emerge, little has been done to interrogate the existing afforestation management frameworks and develop a new model for institutionalisation and management of afforestation as an alternative land use for economic development. Globally, to date, a few studies on afforestation initiatives have been done (see McKenney et al. 2006; Upadhyay et al. 2006; Green, 2009; Dhubain, 2010; Upton, 2015). Nevertheless, the poor uptake and failure of afforestation projects to live up to expectation as a viable land use option in many parts of the globe calls for a causal analysis.

PROBLEM STATEMENT

Despite the growing significance of afforestation in the sustainable development discourse (Luedeling, 2016; Ryan, 2016; Lovell et al., 2017; Dupraz et al., 2019), many afforestation initiatives in the World are failing to convince farmers to adopt afforestation as an alternative land use to agricultural production. As a result, afforestation has failed to proffer anticipated gains (see Wilson, 2016; Dupraz, 2019) with low uptake of afforestation as an alternative land use for economic development (see Wilson, 2016; Ryan, 2016). There is a critical dearth of literature focusing specifically on issues of poor performance and poor uptake of afforestation as alternative land use globally.

RESEARCH OBJECTIVE

This paper seeks to establish from literature the challenges of adopting afforestation as an alternative and sustainable land use option for economic development.

METHODOLOGY

As a doctoral studies-based literature review paper, the authors adopted qualitative critical `content analysis' research technique to unravel the challenges of adopting afforestation as an alternative and sustainable land use option for economic development. According to Utt and Short (2018) critical content analysis is an explicit method for the study of text that also offers flexibility in theoretical approach and textual selection. Bengtsson (2016) illuminates another angle of content analysis by arguing that its purpose is to organize and elicit meaning from the data collected and to draw realistic conclusions from it.

A Google Scholar search was conducted for articles that addressed the phenomenon under interrogation. In order to get relevant articles on the internet, the researcher used the following study focus related search terms: `afforestation', `afforestation challenges', `afforestation' and `sustainable land use', `challenges in afforestation initiatives' among a host varied but similar terms. Both classical and contemporary literature was made use of and a total of 30 articles were reviewed. This number is commensurate with content analysis (see Nueundorf, 2016; Kripperndorff, 2018). The researcher used themes as units of analysis and the results are based on this.

LITERATURE REVIEW

As a point of departure it is imperative that we capture how the phenomenon of afforestation is conceptualised in literature. According to FAO (2010) afforestation is the act of establishing forests through planting or deliberate seeding on land that is not classified as forest. Another view is from Pearson, Walker & Brown, (2006) who view afforestation as the replanting of trees on areas that had been without forest for at least 50 years. It is also seen as a conversion of abandoned and degraded agricultural lands into forests (Pires &

Gonçalves [ed] 2019). The common motif in the above definitions of afforestation is the element of land not having been with any forest or trees on it for a very considerable period. Nevertheless, to state that the land must not have been with a forest `for at least 50 years' is practically controversial since it depends on good record keeping of the vegetation map by all planning authorities.

Globally, there is general consensus that institutions of afforestation in many countries particularly in developing countries have failed to measure up to set policy targets (Luedeling, 2016; Ryan, 2016; Lovell et al., 2017; Dupraz et al., 2019). Similar to many countries, Zimbabwe has sought to increase forest cover too for some time but in vain (Nyikadzino, 2016; CIFOR, 2014; Gwaze & Marunda, 2014).

Existentialism and land use change

Decision-making on whatever land use change to adopt in any spatial setting is an existential issue. It indeed falls within the realm of the political economy of any land jurisdiction. The survival instinct whether weak or strong is behind all the choices humanity makes on land use change hence unless one understands the real drivers of land use change it would be difficult to isolate some of the critical challenges to adoption of afforestation as an alternative land use mode. A large proportion of literature from developing countries deals with the problem of de-forestation (Namaalwa et al. 2007; Sankhayan et al. 2003) but research on afforestation as a sustainable alternative land use has been scarce. However, of late there has been an increase in the volume of literature tangentially touching on afforestation such as non-timber value of forests such as biodiversity management (Tikkanen et al. 2012), biomass production for renewable energy (Lecoq et al. 2011), continuous cover forestry (Assmuth & Tahvonen 2015) agroforestry (Graves et al. 2007) and climate change

mitigation (Pihlainen et al. 2015). However, land use change from agriculture to forestry has received scant attention (Diaz-Balteiro & Romero 2003; McKenney et al. 2006; Upadhyay et al. 2006).

Using a Binary Logistic Regression Model (BLRM) to analyze the driving factors of land-use spatio-temporal change in a large artificial forest area in the Ximeng County, Yunnan province, in Southwest China; Zhao X, Pu J, Wang X, Chen J, Yang E and Gu Z (2018) isolated factors to include land-use policies (protection of basic farm lands and natural reserves), topography (elevation and slope), accessibility (distance to the human settlements) and potential productivity (fertility and irrigation). Focusing on Chile, Braun (2022) observes that the establishment of the plantation industry in this country originally served environmental protection goals, but these quickly became secondary, and economic interests dominated the agenda. Considering the increasing market demand for wood products, the economic motive behind reforestation activities will continue to play a central role in the future. Seemingly, economic rationality continues to be the dominant driver of land use changes globally.

Afforestation and economic development

Forests have been important to most human societies since time immemorial contributing to the livelihoods of many of the 1.2 billion people living in extreme poverty (Bala et al., 2007). They provide products of both social and economic value (see FAO, 2015). Agriculture is the main economic activity (Conniff et al., 2012), but the need for energy is also growing rapidly to satisfy the population's economic development needs. Forests provide global food security and resources, food, fodder, fuel and medicine. However, the economic value of supporting and regulating these services provided by forests is not well-captured in the market and therefore always undervalued. Existing studies fail to tackle head on, the issue of afforestation as alternative land use despite

these potential economic benefits. A lot of people in the rural areas in Africa are benefiting from afforestation thereby leading to economic growth (FAO 2015).

In large areas of developing countries, the loss of trees is causing erosion and degradation of the soil, posing severe problems for economic development. By translating the ecological benefits of afforestation into economic terms, the author demonstrates how investments that benefit the environment often benefit the economy as well. Both the traditional work of the forestry services and tree plantings by farmers are needed, says the author, if deforestation is to be halted and reversed (Anderson 2015). With special reference to Africa, he discusses the underlying reasons for deforestation, suggests policy changes to promote the planting and care of trees, and identifies issues for social and scientific research. Afforestation and reforestation along with agroforestry projects which globally constitute part of various voluntary and mandatory carbon-offset trading structures (Miles & Sonwa, 2015) A case study of the arid zone of northern Nigeria illustrates the benefits that could be brought about by establishing windbreaks and encouraging farmers to plant trees. Besides preventing soil erosion, improving soil fertility, and thus increasing crop production, trees provide fruit, livestock fodder, and much-needed fuel wood and building materials. (World Bank 2014). According to Ochola (2017) in his book `Managing natural resources' afforestation is important in managing ecosystem as well as biodiversity. Afforestation also helps in the increase of food production. Along with it creating a new forest solves the problem of grazing by providing the fodder facility to the cattle (World Bank 2016)

Protective functions of forest resources

Forests have protective functions to the environment such as water catchment protection; climate change mitigation through carbon sequestration; generating clean air; reduction of soil erosion and the risk of landslides, floods and

droughts, and prevent desertification and salinization (TPF, 2018b; FAO, 2018). In some African countries, some forests preserve natural heritage and they should be maintained (FSO 2017). Their unsustainable exploitation however jeopardizes them of delivering on this protective role. This leads to negative environmental impacts such as loss of habitats and biodiversity; less watershed protection (leading to increased soil erosion, siltation of rivers, and the disruption of hydrological systems), reduced availability of important forest products and services and reduction in carbon sinks (Government of Zimbabwe, 2014). Forests are important as they preserve the ecosystem as well as minimizing soil erosion as well as holding wet soils for farming (Chademayo 2010). The role of wetlands has come to be acknowledged in the removal of carbon dioxide, and wetland ecosystems provide an optimum natural mechanism for the sequestration and long-term storage of carbon dioxide (Mitsch et al., 2012). Due to afforestation-reforestation activities (erosion control, range rehabilitation, private afforestation, artificial regeneration) in Turkey, approximately 6.69%of its territory was afforested-reforested between 1946 and 2018 (GDFSTAT, 2018).

In afforestation studies, the selection of species for the local climatic conditions and determination of appropriate afforestation techniques (Çalışkan & Boydak, 2017; Reisman-Bermanet al., 2019; Sabır et al., 2020), as well as the identification of afforestation areas (Sevillano et al., 2018; Varolet al., 2019; West et al., 2020), play an important role in achieving the long-term targets. Harvested wood products, which are an out-put of forest assets, contribute to reducing the amount of carbon in the atmosphere by storing it (Donlan et al.,2012; Jasinevičius et al., 2018; Ji et al., 2016; Tonn &Marland, 2007). While the evaluation of both forest assets and their outputs in the international arena continues, the Paris conference was held in 2015 in response to international activities and achieved the highest recorded number of

participating nations. As a result of this conference, the Paris Agreement was ratified (UN, 2015). The fifth article of the Paris Agreement emphasizes supporting policies that develop and designate forests as carbon storages and sinks (UN, 2015). As in the UNFCCC and Kyoto Protocols, the Paris Agreement addressed and emphasized deforestation and forest destruction (UN, 2015).

As shown from the statistic, trees can help combat climate change because trees absorb carbon dioxide. On average a single tree can absorb 48 pounds of carbon dioxide per year[3]. As a result, planting more trees can restore the natural balance of carbon in the atmosphere[4], but only if we plant the right trees. As well as this, farmlands are often created from clearing forests. Therefore, clear-cutting forests creates more run-off and soil erosion[5]. In other words, this degrades the land, which makes it hard for the land to restore itself on its own. This is why replanting trees is vital (Deziel, 2018, Gellert, 2017, Bastin et al 2019, Buis 2019).

Socio-economic functions

Forests and trees have important multiple functions and provide a wide range of forest goods and products that include fodder, medicines, timber, construction materials, foods and firewood for energy. In Zimbabwe, 65 percent of households use wood as a main source of energy for cooking (Labour Force Survey, 2014). At its peak, in Zimbabwe the forestry sector directly employed 14 445 people and over 40 000 indirectly in the downstream industries and contributed 3% to the Gross Domestic Product (GDP) (FAO, 1999).

One forest management issue is how to create links between human well-being and ecological sustainability (Colfer and Byron 2001) Forest products are not only earmarked for the local market but are exported to the region and generate

the much needed foreign currency in view of the liquidity crunch the country is going through. In 2016 wood and articles of wood, wood charcoal exported by Zimbabwe (Harmonised Systems Code 44) raked in $23. 64 million in export revenue with Zambia, Botswana, South Africa and Mozambique constituting 99.5% of the market share. Thus, from such statistics, one begins to see the potential of afforestation as an alternative land use option for economic development.

Rural communities have adopted alternative livelihood and income generating activities through the sale of forest and non-forest products such as firewood trade, wild fruits to middlemen who resell them in the urban areas; honey production and caterpillar (i.e. Mopani worms) harvesting (Human Development Report, 2017). Another benefit Zimbabwe is enjoying from its forests is nature based tourism. The sector is currently on a growth path and is expected to boost the tourism induced economic growth. Afforestation also helps to develop and restore long lost ecosystem areas. They also help to increase species biodiversity within those regions. Governments and organizations like *Environment buddy* are using afforestation to covert semi-arid or arid regions into productive regions which not only fights global warming and climate change but does it in a much more aesthetic manner (Soomro 2015).

RESULTS AND DISCUSSION

The study isolated a number of challenges that are faced in the adoption of afforestation as an alternative and sustainable land use option for economic development. Specifically, the following themes were isolated through critical content analysis that is, ignorance of the benefits of afforestation, anachronistic cultural attitudes, institutional and capacity challenges, lack of education and training, afforestation taking too long before giving returns, lack of capital and

ignorance of existence of funding partners in afforestation, lack of adequate extension services for afforestation, insecure land tenure arrangements for forest land and wildlife menace.

Ignorance of the benefits of afforestation

One of the major challenges faced in the promotion of afforestation as an alternative and sustainable land use option for economic development in Zimbabwe is inadequate knowledge of the potential economic gains that may accrue from afforestation initiatives. Malone (2008) dissects this complexity by listing common themes that impact levels of afforestation. This stems from the fact that most countries lack a `farm forestry' tradition within agriculture. Further to, this translates into a lack of economic knowledge in relation to the returns from afforestation and a lack of management expertise in relation to appropriate management (silviculture) of forests (see Ryan, 2008; 2016).

These barriers are further compounded by evidence to indicate that where opportunities afforded by forestry development exist, these are very often overlooked or dismissed by farmers due to attitudinal factors such as emotional attachment to the land or negative attitudes around the perception of failure in farming (Malone 2008). Forestry has traditionally not been seen as an integral part of traditional agriculture and most farmers consider forestry only as an alternative land-use for their worst land (Ní Dhubháin & Gardiner 1994). However, despite the poor uptake of afforestation as an alternative land use due to farmer ignorance afforestation has been found to be economically beneficial globally.

Anachronistic cultural attitudes

Evidence from the literature attribute some cases of poor uptake of afforestation as alternative land use to out-dated cultural values. Green (2009) opines that

negative cultural attitudes towards forestry have also been widely reported in some countries. In a study conducted in Finland, Selby and Petajisto (1995) noted that there was a perception that converting land to forestry can sever the dynamic historical process involved in the creation of agricultural landscapes and thereby have a negative effect on local communities. Similarly, in the UK, Watkins et al. (1996) found that most farmers did not want woodland on their farmland, as they see their land as being exclusively a preserve for agricultural production. Forestry has traditionally not been seen as an integral part of traditional agriculture and most farmers consider forestry only as an alternative land-use for their worst land (Ní Dhubháin & Gardiner 1994).

In another study of six Latin American countries, that is, Argentina, Colombia, El Salvador, Honduras, Nicaragua and Peru, designed to assess the current status of forest tenure reforms, noted a historical and current bias towards promoting agriculture and cattle raising activities, leaving the sustainable use and conservation of forest as a secondary priority (see Warnholtz, Gerardo, Fernandez, Smyle and Springer, 2017). Noteworthy is that in the same study the authors observed that agricultural policies in the six countries continue to promote changes in land use from forests to agricultural or pasture, giving titles to individual landowners who can prove that they are and have been cultivating the land for crops for a long time. This scenario is obviously attitude based and clinging on historical circumstances. Green (2009), Dhubain (2010), and Upton (2015) share this concern by hypothesising that there maybe global commonalities in relation to stakeholder attitudes around the adoption or non-adoption of afforestation.

Institutional and capacity challenges

Institutional approaches to regulation of forestry suffer from conflicting interests with other regulations (see UN, 2008; Chimhou et al., 2010;

Chigumira et al., 2019). According to Chigumira et al. (2019) in the case of Zimbabwe, there are conflicting legal frameworks that discriminate against afforestation setting itself up as a strong and viable land use option. A close analysis of literature highlighted a number of anomalies in the national legislation that afforestation in Zimbabwe is grappling with which include among others the Mines and Minerals Act vs. Forest Act where the former confers land rights to the miner over the forester, Land Resettlement Act vs. Forest Act where land for afforestation is being converted into agricultural land (see Government of Zimbabwe, 2016, *Timber Producers' Federation* [TPF], 2018, Chigumira, 2019). This disharmony between policies has weakened the institutionalisation and management of afforestation as a viable land use option.

Though Zimbabwe is a signatory to numerous international and regional agreements and protocols on the environment (Government of Zimbabwe, 2016; Forestry Commission, 2018), weaknesses of the Forestry Commission, a body mandated with implementing the Forestry Act has negatively impacted on afforestation initiatives. Loss of experienced and competent staff to greener pastures (Chimhou et al., 2010; Chigumira et al., 2019) has led to a widening skills gap and loss in institutional memory (UN, 2008; Timber Producers Federation, 2018; FAO, 2015). Evidence suggest that institutionalisation of afforestation has not been effective as publicly owned forest area declined from 13,852,000 ha in 1990 to 9,868,000ha in 2015 (Chigumira et al., 2019) whilst privately owned forest declined from 8, 312,000 ha in 1990 to 5,756, 000ha in 2015 (FAO, 2015). Thus, it is inevitable to conclude that institutions in charge of afforestation have not been effective. Nevertheless, the issue of institutions failing in their mandate thereby jeopardising afforestation initiatives as alternative land use is not exclusive to Zimbabwe. According to Harwell (2010) failure to reform forest governance *institutions* has meant the continued destruction of both forests and forest livelihoods. In a study of areas in conflict

in Africa, Harwell (*Ibid*) argues that forests suffer when management and law enforcement institutions are themselves destroyed by conflict.

Lack of education and training

The generality of studies on afforestation challenges highlight poor education and training as one of the hindrances to the uptake of afforestation as an alternative and sustainable land use. Research findings identified education and training as another strategy and mechanism for developing best practices in afforestation. Education and training are used synonymously for the enlightenment of individuals about what should be known with regards to afforestation related issues. Most scholars in literature frameworks (see Lubowski, Plantinga, & Stavins, 2006; Nielsen, Plantinga, & Alig, 2014; Tian, Sohngen, Baker, Ohrel, & Fawcett, 2018) regard education and training as influential in facilitating effective afforestation strategies. They used terms such as `knowledge acquisition', `equipping with skills', `enlightening and provision with relevant information', `teaching', `learning', `programs' and `schooling' in most of their write up revealing underscoring the significance of education and training to uptake of afforestation as alternative land use. Ryan, O'Donoghue & Phillips (2016) argue that as the farm afforestation decision essentially involves an inter-temporal land use change, farmers need comprehensive information on forest market returns under different environmental conditions and forest management regimes.

However, some education and training models offered elsewhere may not be compatible with the expectations of all cultures. Fishbein and Ajzen (1967)'s theory of reasoned action finds relevance here. Reasoning helps to determine a course of action based on the expected outcomes. The theory offers insights on the importance of considering the extent to which a model can or cannot be applicable to a certain context. In sum, designing education and training that

encourages uptake of afforestation as an alternative land use should be based on a befitting rationale and curriculum.

Aversion to long term investment

Historically, reforestation has been a strong long-term investment for landowners. Many landowners regularly invest in other long-term investments such as individual retirement accounts (IRAs), stocks, and bonds but forego the likely chance to earn high returns from timber production (NC[1] State Extension, 2022). Depending on the environmental conditions, an afforestation project takes an average of 7-10 years before reaching maturity to offer meaningful returns to the farmer. Sustainable afforestation therefore implies a typical long-term investment in a forestry project. FAO (2007) highlighted that forestry projects require high rates of financing at the beginning, forests take some time to deliver revenues and benefits. Hence investors face high initial costs and delayed returns, which demands the availability of initial investment capital and the ability to wait for revenues (FAO, 2007). Such huge financial injections needed at the initial stages of afforestation projects act as hindrances, and further the uncertainty surrounding most farms discourage afforesters and potential afforestors from investing in afforestation.

Lack of capital and ignorance of existence of funding partners in afforestation

The problems identified include among others, financial in-capacitation as most afforestors and potential afforestors are suffering from inadequate financial muscle to undertake afforestation initiatives. Fao (2007) highlighted that forestry projects require high rates of financing at the beginning, forests take some time to deliver revenues and benefits. Hence investors face high initial costs and delayed returns, which demands the availability of initial investment

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[1] North Carolina

capital and the ability to wait for revenues (FAO, 2007). Financial challenges have meant that responsible authorities lack the finances to hire or train experts in the field of afforestation, provide funding to afforestors. However, evidence from studies show that there are now organizations that partner afforestors and provide all funding for a certain percentage to be paid during harvesting. However, the challenge has been that afforestors lack of information on existence of organizations to partner with in afforestation.

Lack of adequate extension services for afforestation

In broad sense extension is an education process that informs, convinces and links people. It facilitates flows of information between farmers and other resource users, administration managers and leaders (Ahmed Mohammed, 2001, Ageed, 2002). One of the challenges that has been common and resulted in the failure of most afforestation initiatives has been the inadequacy of extension services for afforestation. In a study on role of forestry extension in promoting afforestation in Khartoum State, Mohammed (2001) found that 82% of his respondents stated that there were no extension visits to farmers. The extension personnel focussed on agricultural issues on the expense of forest trees. In another study conducted in Limpopo Province (South Africa) by Maponya, Venter, Du Plooy, Backeberg, Mpandeli & Nesamvuni, (2019) results also indicated that less than 45% of farmers received extension services, mainly through formal extension service. Bukomeko (2012) had similar findings of inadequate forestry extension services in lira district of Uganda. According to FAO (2007), the planting of trees is not fundamentally a forestry issue, it is a farm system and social issue and therefore there is a need for an `extension approach' which treats trees as one of many potential productive activities that must be incorporated into the farm system.

Insecure land-tenure arrangements for forest land

According to Schlager and Ostrom (1992) in Larson (2012) with regard to forests, and particularly collective forests and resources, the term tenure rights refers to a bundle of rights ranging from access and use rights to management, exclusion and alienation. The problem of land ownership is one of the most serious problems in the history of forest lands (Mahommed, 2001). Secure tenure rights are a critical foundation for local economic development. Although promising progress has been made by many developing countries, particularly in Latin America, to introduce legal frameworks and targeted policies to transfer or devolve forest rights to local people, in many cases, these reforms remain partial and far from materializing (Warnholtz et al, 2017). Institutional investment in forestry and afforestation has been most active in countries where there are straightforward and secure legal rights to land and timber such as USA, Australia, New Zealand and a few others (Binkley, Stewart & Power, 2020). Secure land tenure is quite necessary especially for attracting individuals in partnership with institutions or individuals and institutions separately, to take up afforestation as an alternative land use. Hence, a secure tenure is absolutely necessary given that investment in afforestation is long term in nature.

Wildlife Menace

Baboons and to a lesser extent monkeys, have wreaked havoc to the afforestation growth particularly in timber plantations (FAO, 2015). The former destroy trees through bark stripping, ring barking, uprooting planted seedlings and damaging tree tips (*Timber Producers' Federation* [TPF], 2018b). Bark stripping often leads to growth retardation; mortality and tree deformation leading to yield reduction and if left without control this damage can to a great extent negatively impact on the viability of commercial timber (TPF, 2018b). In

the plantations, emerging pests affecting eucalyptus trees include the bronze bug *(Thaumastocorisperigrinus),* Blue gum chalcid *(Leptocubeinvasa)* and Red gum lerp *(Glycospisbrimblecombey)* (TPF, 2018b).

CONCLUSION

Content analysis of literature on `adoption of afforestation as an alternative land use' yielded a variety of insightful challenges. However, a close analysis of the spectrum of challenges zero in on three (3) that are critical to optimizing uptake of afforestation. These are, in order of importance, security of land tenure or land rights, access to extension services and access to investment capital. Dealing with these three challenges is pivotal to meeting policy targets for adoption of afforestation as an alternative land use for economic development. The challenge of security of tenure comes first in consideration because nobody would want to put his or her hard won money where tenure is not guaranteed. Hence, the issue of security of tenure on potential afforestation land should be addressed first before extension officers sell the idea of afforestation to interested institutions or individual farmers. Once the challenge of land tenure is dealt with then next to be addressed should be the issue of access to forestry extension services. This should come in form of an omnibus of services to afforestation farmers addressing issues of access to capital and technical knowledge. In sum, extension officers should educate farmers on the value-chain of the forestry industry. The last critical challenge that must be addressed is capitalization of afforestation project. Without capital, afforestation will not take off because the various inputs required for the project to succeed need money. Through extension services farmers should be educated on available modes of funding. Seemingly, if the current zeal for extension services in agricultural production is matched in afforestation then the adoption of

afforestation as an alternative land use for both the so called `bad land' and `underutilized land' would proliferate across the globe.

REFERENCE LIST

Angel, P et al (2017). *The Appalachian regional reforestation initiative*. Available at: https://www.osmre.gov/programs/arri

Assmuth, A. & Tahvonen, O. (2015). Continuous cover forestry vs. clearcuts with optimal carbon storage. Paper presented at BioEcon 2015, Cambridge, England,

Ayana, A.N.; Vandenabeele, N.; & Arts, B. (2015). Performance of participatory forest management in Ethiopia: institutional arrangement versus local practices. Crit. Policy Stud., 11, 19–38.

Bastin, J-F et al (2019). *The global tree restoration potential*, Science. Vol 365, issue 6448.

Bjork Fredrik (2004). 'Institutional theory: A new perspective for research into IS/IT security in organizations'. In International Conference on System Sciences. Hawaii. Available at: http://csdl2.computer.org/comp/proceedings/hicss/2004/2056/07/205670186b.pdf

Bryman, A. (2008). Social Research Methods Third Ed. *Oxford University Press*.

Bryman, A., & Bell, E. (2017). Business Research Methodology. In *Research Methodology*. https://doi.org/10.1021/ja100922h

Buis, A (2019). *Examining the viability of planting trees to help mitigate climate change*, NASA.

Buis, A (2019). *Examining the viability of planting trees to help mitigate climate change*, NASA

Cohen, L., Manion, L., & Morrison, K. (2011). Surveys, longitudinal, cross-sectional and trend studies. *Research Methods in Education, 7th edition. Abingdon: Routledge*, 261-264.

Costanza R. (2011). Changing the Way, We View Humanity and the Rest of Nature Solutions for a Sustainable and Desirable Future 2(6):1.

Cross, R. & Baird, L. (2000). 'Technology is not enough: Improving performance by building organizational memory'. Sloan Management Review, 41 (3), 69-78.

Crossan, M. & Bedrow, I. (2003). 'Organizational learning and strategic renewal'. Strategic Management Journal, 24, 1087-1105.

Crossan, M., Lane, H. W., & White, R. E. (1999). 'An organizational learning framework: from intuition to institution.' Academic Management Review, 24, 522-537.

Crossan, M.M., Lane, H.W., White, R.E. & Djurfeldt, L. (1995). 'Organizational learning: dimensions for a theory'. The International Journal of Organizational Analysis, 3(4), 337-360.

Deziel, C (2018). *Environmental Problems Caused by Deforestation of Tropical Rain Forests,* Sciencing.

DiMaggio, Paul J., and Walter W. Powell. (1983). "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields," American Sociological Review 48:147-60.

Duesberg, S., Ní Dhubháin, A. & O'Connor D. (2014). Assessing policy tools for encouraging farm afforestation in Ireland. Land Use Policy 38,194-203.

Duguma, L.A, Atela, J; Minang, P.A; Ayana, A.N; Gizachew, B; &Nzy, J.M. (2019). Deforestation and Forest Degradation asan Environmental Behavior: Unpacking RealitiesShaping Community Actions, Land

FAO - Food and Agriculture Organization. (2015). The State of World's Land and Water Resources for Food and Agriculture. Managing Systems at Risk. FAO, Rome.

Forestry Commission. 1996. Zimbabwe land and vegetation cover area estimates. VegRIS Project. Harare. Frost, P.G.H, 1996. The ecology of miombo woodlands. In: Campbell, B. (ed.) The miombo in transition. Woodlands and welfare in Africa. CIFOR, Bogor, Indonesia.

Garay, L., & Font, X. (2012). Doing good to do well? Corporate social responsibility reasons, practices and impacts in small and medium

accommodation enterprises. *International Journal of Hospitality Management*, *31*(2), 329–337. https://doi.org/10.1016/j.ijhm.2011.04.013

Gargoo (2001). Alternate Land Use Based Farming systems in Rainfed AgricultureFormer PC (AICRPDA), Central Research Institute for Dryland Agriculture, Hyderabad – 500 059

Gellert, A (2017). *How does deforestation affect the weather?* Sciencing.

Greene, W. H. (2003). Econometric Analysis, Prentice Hall, New Jersey

Hoskins Marilyn (1982). Social Forestry in West Africa: Myths and Realities" in American Association for the Advancement of Sdem:e Annual Meeting, AAAs, Washington DC.

Hull, R.B.; Kimmel, C.; &Robertson, D. (2016). Innovating solutions to deforestation: cross-sector collaboration in theAmazon. J. Entrepreneurship Organ. Manag. , 5, 172.

Ismail, M. (2009). Corporate Social Responsibility and its role in community development: An International perspective. *Journal of International Social Research*, *2*(9).

Kafley, N.P. (2011). Hermeneutic Phenomenological Research method simplified. Bodhi: An Iterdisciplinary Journal, Vol. 5 pg 181-200.

Krejcie, R. V, & Morgan, D. W. (1970). <159. 1970 Krejcie & Morgan.pdf>. *Educational and Psychological Measurement*.

Lewis, S.L et al., (2019). *Restoring natural forests is the best way to remove atmospheric carbon*, nature 568. 25-28.

Mackenzie, N. & Knipe, S. (2006). Research Dialemas: Paradigms, Methods and Methodology. Issues in Educational Research, Vol. 16 (2) pg 193-205.

Malone, J. (2008). Factors affecting afforestation in Ireland in recent years. Report for the Minister of state with responsibility for forestry. Available at: http://www.ifa.ie/linkClick.aspx?fileticket=N5243ioVRio%3D&tabid=615

Maree, J. G. (2012). Career adapt-abilities scale—South African form: Psychometric properties and construct validity. *Journal of Vocational Behavior, 80*(3), 730-733.

MET. 1998. Zimbabwe biodiversity strategy and action plan. Status of biodiversity, Unmet needs, strategies and actions. Harare, Republic of Zimbabwe.

Millington, A., and Townsend, J. (eds.) 1989. Biomass assessment. Woody biomass in the SADC region. Earthscan Publications Ltd, London. UK.

Minang, P.A. (2018). Values, Incentives and Ecosystem Services in Environmentalism. In Rethinking Environmentalism: Linking Justice, Sustainability, and Diversity; Strüngmann Forum Reports; Lele, S., Brondizio, E.S., Byrne, J., Mace, G.M., Martinez-Alier, J., Eds.; MIT Press: Cambridge, MA, USA, 2018; Volume 23

Muir K (1989) "'The Potential Role of Indigenous Resources in the Economic Development of Arid Environments in Sub-Saharan Africa" in Society and Natural ResotIl'a!S V012:3 (f<Xthcoming). (See also Dept of Agricultural Economics, University of Zimbabwe, WOfting Paper 9188).

Nastasi, B. K., Hitchcock, J. H., & Brown, L. M. (2010). An inclusive framework for conceptualizing mixed methods design typologies: Moving toward fully integrated synergistic research models. *Handbook of mixed methods in social & behavioral research*, 305-338.

Ní Dhubháin, Á Maguire, K., &Farrelly, N., (2010). The harvesting behaviour of Irish forest owners. Forest Policy and Economics 12: 513–517.

Nkonya E., N. Gerber, P. Baumgartner, J. von Braun, A. De Pinto, V. Graw, E. Kato, J. Kloos, &T. Walter. (2011a). The Economics of Land Degradation.Toward an Integrated Global Assessment.Development Economics and Policy Series #6. Internationaler Verlag der Wissenschaften, Frankfurt

O Leary, T.N., McCormack, A.G. & Clinch, J.P. (2000). Afforestation in Ireland: regional differences in attitude. Land Use Policy 17, 39-48.

Oberg, H., & Bell, A. (2012). *Exploring phenomenology for researching lived experience in Technology Enhanced Learning.* Paper presented at the The Eighth International Conference on Networked Learning.

Radhika, D et al (2019) *Second Bonn Challenge progress report: application of the Barometer in 2018*, IUCN

Raosoft. (2018). Raosoft sample size calculator. Available at: http://www.raosoft.com/samplesize.html.

Reiners, G.M. (2012). Understanding the difference between Husserl's (Descriptive) and Heidegger's (Interpretive) Phenomenological Research. Journal of Nursing Care, Vol. 1 (5) pg 1-3

Ryan, M. & O'Donoghue, C. (2016). Heterogeneous Economic and Behavioural Drivers of the Farm Afforestation Decision. Conference paper presented at 18th BIOECON conference. Kings College, Cambridge.

Saunders, M., Lewis, P., & Thornhill, A. (2016). Formulating the research design. *Research Methods for Business Students*. https://doi.org/10.1007/978-1-60327-198-1

Scott, W. R. (2001). Institutions and Organizations: Foundations for organizational science. (2nd Ed.) Thousand Oaks, Ca: Sage.

Scott, W. Richard. (2004). "Institutional theory." in Encyclopedia of Social Theory, George Ritzer, ed. Thousand Oaks, CA: Sage. Pp. 408-14

Sedgwick, P. (2013). Convenience sampling. *BMJ*. https://doi.org/10.1136/bmj.f6304

Segura Warnholtz, Gerardo, with Mercedes Fernández, James Smyle and Jenny Springer. 2017. Securing Forest Tenure Rights for Rural Development: Lessons from Six Countries in Latin America. PROFOR, Washington DC.

Shumba E. (2001). Paper prepared for an international workshop on "Integration of Biodiversity in National Forestry Planning Programme" held in CIFOR Headquarters, Bogor, Indonesia on 13-16 August 2001.

Shumba, E. M. and Marongwe, D. 2000. The Convention on Biological Diversity: an overview and lessons learnt from the Zimbabwean experience. International Forestry Review 2(2).

Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). The sample size debate: response to Norman Blaikie. *International Journal of Social Research Methodology*. https://doi.org/10.1080/13645579.2018.1454642

Tahvonen, O., Pihlainen, S., & Niinimäki, S. (2013). On the economics of optimal timber production in boreal Scots pine stands. Can. J. For. Res. 43(8), 719-730.

Utt, J., & Short, K. (2018). Critical Content Analysis: A Flexible Method for Thinking with Theory. *Understanding and Dismantling Privilege*, 8(2), 1 - 7.

White. 1993. The vegetation of Africa. UNESCO. Whitlow, T. R. 1988. Land degradation in Zimbabwe. A geographical study. Geography Department, University of Zimbabwe.

Whitmer, P (2019). Negative effects of clear-cutting. Sciencing.