

Land resource regimes in Zambia: Implications on local food systems

ABSTRACT

Aims: To review literature on available land resource regimes in Zambia and how these resource regimes affect rural food systems

Methodology: Literature review of government reports, legislature and published material on land resources in Zambia.

Findings: The country's land resources are governed either through statutory or traditional/customary regimes. Statutory governance is characterized by recipients having exclusive ownership rights to utilized resources while customary resources are under traditional authorities and recipients utilizing customary resources have no exclusive ownership to the resources. Land under customary governance is responsible for most of the food produced for rural and urban consumption. Sustainable governance of these land resources translates into sustainable management of food systems. The study identified allocation of exclusive land and resource property rights to local food producers, devolution of powers from the central government to locals, regulation of urban demand for resources, site-based resource governance, promoting conservation agriculture among local producers and building resilience of food systems towards shocks and stressors as means to improve management of land resource for sustainable food systems.

Conclusion: Natural resource governance in Zambia needs to embrace a bottom-up approach and encourage systems allowing for innovation, diversification and possible intensification in local food production.

Keywords: Customary, statutory, land, food security, regime, governance mechanisms

1. INTRODUCTION

Governance of natural resources (NR) entails the exercise of responsibilities and power, decision making processes and local citizenry involvement in the process that is influenced by institutions and cultural norms for purposes of enhancing sustainable management and utilization of natural resources [1]. Effective land resource governance starts with the central government devolving powers to the locals so that issues affecting them can be managed locally [2]. Land resource management impacts not only the sustainability of resources but also the stability of livelihoods dependent on these resources and their food systems.

Human utilization of land and influencing governance regimes exhibit diversity and dynamism in the long term [3]. Depending on the developmental need, traditionally managed resources could be gazetted to become state owned/managed. A formally gazetted area, such as a forest, could be de-gazetted to allow for such activities as agriculture. Resource governance systems are premised on practices, governing principles and existing institutions that communities adhere to in their utilization of shared resources [4]. This is mostly true with shared resources which are managed communally. Governance is deeply rooted in the cultural traditions of the communities benefiting from the resources. Even in such cases, long term benefits to the host communities only accrue when utilization is sustainable. This ensures that the available resource governance systems are able to respond quickly and flexibly to social and environmental perturbations [5].

The majority of natural resources in Zambia such as land, forestry, fisheries and water are either owned or controlled by the state or traditional authorities. However, these main controlling authorities have allowed for private leasehold and management of certain portions of the resource particularly land which

could be placed under private leasehold. Certain resources such as fisheries, forestry, water, game etc. still remain under the control of the state or traditional authorities. These are shared resources utilized for public good. Effective governance of shared resources starts with establishing management regimes strong enough to influence human behavior's ability to attain set goals yet still be operational in the long term, and robust enough to withstand external forces capable of destabilizing the system [6]. However, there is a current increase in privatization of these resources as the trend of individuals leasing land resources increase. Private leasehold of resources is a global trend [7; 3]. Such ownerships increase the active interaction between private and public resource governance institutions. The current study analyses the current resource governance regimes in Zambia and their implications on local smallholder food systems.

1.1 Governance and governance mechanisms of land resources in Zambia

Land resource governance is at the core of human relationships with processes managing the biological and physical cycles [8]. Current communities are facing challenges of rapid change, increased risk, inadequacies in agriculture policies, increased land degradation, growing cultural and biodiversity loss, livelihood insecurity and chronic hunger to agricultural communities [9] all factors at play in destabilizing food systems and ensuring food insecurity. Land resource governance in Zambia starts from the top to bottom placed institutions. The Land Act of 1995 [10] places ownership of land resources in the Presidents hands. This implies that whether the land is statutory or customary controlled, the President is the ultimate authority over governance of such land. As such, the president can sanction either the gazettement or de-gazettement of any land resource as seen fit. Professional bodies such as the Zambia Environmental Management Agency, The Ministry of Lands and Natural Resources as well as locally placed District/Municipal councils oversee land management issues at different hierarchical levels. Livelihoods are affected by the interplay between policies, institutions, processes and power relations influencing resource governance. The institutions set the policies which dictates processes followed in resource utilization at the local level. These influencing mechanisms are collectively known as governance mechanisms.

1.1.1 Policy

These are the standards and principles governing land resource management and utilization. Policy provides guidelines which influence and enforce human behavior for the purpose of not only managing but also regulating utilization of available land resources. Zambia follows a multi-sectorial system of natural resource governance. Environmental management issues are governed in the framework provided by the National Policy on Environment (NPE) of 2007 [11] and the Environmental Management Act (EMA) of 2011 [12], which are supported by many other policies and strategies developed for other sectors such as the Land Act, Forest Act, the Wildlife Act, the Water Act and the Fisheries Act.

Rural communities have also set up their own guidelines (customary laws) governing the use of their available resources. For example in rural areas of Singani, Choma District, where the locals are smallholder farmers, use of forest resources is mostly restricted to Non Timber Forestry Products (NTFP), with the exception of individuals who encounter crop failures and might need to engage in charcoal production for survival till the next growing season. In this case, permission is sought from the traditional authorities who select particular trees which could be cut and how they should be cut to enhance regeneration. These customary laws within communities are enforced by traditional authorities.

1.1.2 Institutions

These are organizations mandated with the responsibility of overseeing access, management and utilization of land resources. In Zambia, this responsibility lies with the Ministry of Lands, Environment and Natural Resources (MLENR) which oversees policy implementation and regulations governing resource conservation and utilization ensuring sustainability. The ministry has departments within different districts. However, the EMA of 2011 also provided for the establishment of the Zambia Environmental

Management Agency (ZEMA) which is charged with ensuring sustainable management and protection of the environment [12]. This body is responsible for implementation of activities of all ministries and conservation authorities relating to the environment.

1.1.3 Processes

A 'process' in land resource governance is an established practice or procedure that dictates how resources are utilized or managed. Processes provide methods of conversion of policies by institutions into practice at different levels. Processes in resource governance regulate practices of access and use of land resources, decision making, conflict resolution, innovation and capacity building.

2. METHODS

This paper is a comprehensive review of existing literature on land and NR governance in Zambia and its implications on local food systems. The review included data on change in resource governance, customary against statutory resource governance as well as impacts on local food systems. This comprehensive review of existing literature on land resource governance and local food systems was conducted to gain a better understanding of concepts in resource governance and food systems. While the study of food systems is still in its infancy in Zambia, a review of studies conducted in other parts of the world helped the researcher analyze potential similarities and/or differences expected in the study area. Several government reports, legal documents and strategic plans were reviewed to clarify the role of government in management of both statutory and customary resources.

3. STATUTORY VS. CUSTOMARY MANAGEMENT OF LAND RESOURCES

Natural resources in Zambia are either under state management or are managed customarily under traditional authorities. From an economical perspective, land is the most important natural resources in Zambia as it forms the basis for local livelihoods [13]. Conversely, it's also a major source for conflicts either between individuals or between the state and traditional authorities. Nearly half of Zambia's land is potentially arable (47%) [14]. However, only 14 % of the land is actually utilized for crop production [15]. The rest of the land is either gazetted as National Parks, Game Management Areas or forests. Some of the available arable land is not used for arable agriculture as it is located in remote areas and would require heavy investment such as roads and public services to make it accessible and usable to smallholder farmers [14]. Patterns of distribution of land within the customary tenure are still largely unknown [16]. However, most of the customary land is too remote to be accessed by smallholder farmers, leading to competition for the available and accessible arable land nearby.

Statutory and customary resource governance differs in the resource rights attached to each. State lands are usually open to private lease while customary land remains under traditional control. While traditional authorities have the final say under customary land tenure, they are usually powerless in state land tenure, hence not always eager to approve change of land tenure systems. Conversions of customary land to state land means traditional authorities relinquishing their power and this often undermines the authority traditional leaders have over the land [17]. Customary land tenure often discourages huge private and long-term investment, due to its lack of security because of weak personal ownership schemes. The hazy security nature of the customary land tenure system makes it difficult for investors to plan in the long-term. Often this has resulted in traditional land being less developed.

Traditionally managed resources can change tenure to statutory when gazetted. Whenever a resource is identified in a customary tenure for project development, ZEMA consults with the traditional authorities responsible for that particular resource before sanctioning the project. Both parties have to agree before a particular developmental project would be sanctioned. A failure on either party to agree often results in the project not taking off. On the other hand, if a consensus between parties is reached, the resource in question is gazetted. ZEMA still has the authority to overrule traditional authorities if the sanctioned project is deemed to poses adverse impacts on the environment. De-gazetting of a resource happens if a

formerly restricted resource gets encroached. For example, a forest encroached for smallholder agriculture can be de-gazetted and converted to agriculture land.

The enactment of the Land Act of 1995 coincided with the increase in cases of customary land resources being converted into leasehold tenure. The exacerbated rates of conversion have been due to the Act affirming such conversions. Section 8 (1) of the Land Act of 1995 states that, "... any person who holds land under customary tenure may convert it into leasehold tenure not exceeding ninety nine years on application" [18]. Furthermore, section 8(2) provides for foreign companies or government to obtain any land as long as the individual or institution proves that they are investors and obtains a presidential consent which is issued by the commission of lands. This highlights political will or interference as another cause for change in resource governance. It is this clause which provided for the settlement of many white commercial farmers who were forced to leave Zimbabwe between 1999 and 2008, to settle in Zambia. The land on which these farmers were settled had to be state land to allow for long-term secure investment.

Land resources have also changed governance regimes whenever a valuable mineral resource is discovered on customary land. In such cases, a cost-benefit analysis of converting the land from its current use to a mining area would often be conducted and based on the results, the land could either be gazetted or not. Traditional authorities responsible for the land under which the resource is situated would often have to give consent before the project is implemented. Other developmental projects such as construction of a national stadium, schools, hospitals, shopping malls have all resulted in a change in tenure of the land resource affected.

4. HOW ARE LOCAL FOOD SYSTEMS AFFECTED BY THE LAND RESOURCE REGIMES IN ZAMBIA?

Global environmental change, biodiversity loss, land degradation, change in hydrological regimes, change in climatic patterns due to anthropogenic greenhouse gas emissions, growing demand for food both in rural and urban communities have had consequences on food security and food systems [19]. These are governance issues which affect both livelihoods and resource security. The purpose of every form of resource governance is to achieve economic and food sustenance at the same time sustainably managing available resources. The state of how healthy a community's food system will be in the long-term is measured by its current vitality and sustainability [20]. Designing simple sustainable local food systems rooted and sustained locally can provide the stability and vitality necessary for improving economic viability, social equity and ecological protection at a local level. Hence resource regimes should improve availability, access and utilization of resources and do so sustainably.

4.1 Food availability

Customary land tenure is the most common form of land acquisition in most rural areas of Zambia. Agriculture is the mainstay for the majority of households in communities under customary tenure. These communities are the food producers hence production is their most important attribute of food availability. Households have to either depend on their produced food for sustenance or engage in exchange at agriculture markets or with other farmers who have what they need [21]. Rural households in Zambia represent subsistence farmers who are perpetual producers of the staple crop for consumption and occasionally selling off their surplus [22]. Hence the size of land available to them determines the amount of their produce and eventually their food availability and income. Increase in production for these households is largely due to agriculture extensification rather than intensification, hence the bigger their land, the higher their crop production [23].

Urban based communities in Zambia are largely individuals engaged in formal and informal employment or are manufacturers. These urban communities are not direct food producers and mostly inhabit planned state lands. Unlike most lands under customary tenure, most state lands are serviced by government controlled utility companies. This has contributed to the reduced of development for customary lands. Another challenge facing households under customary land tenure involves a lack of property rights

which includes rights to lease and use of the land resources they occupy [3]. Unlike state lands of which individuals or institutions have leasehold to their property, land resources under customary tenure remains under the control of traditional authorities. This impedes enhanced productivity as ownership of property rights is cardinal to staking comprehensive ownership claims of land by indigenous peoples and instituting innovative production approaches.

For most urban communities (communities on titled state land), food production is not the most important component in their food system-food distribution and exchange are. Since these communities are not agriculture oriented, they depend on the food produced by rural farmers (both smallholders under customary land and commercial farmers under state land) which reaches them through exchange markets. The interplay in food availability from production to exchange involves effective management of the source of food which for the locals is customary land. However, it is the inhabitants of state lands who provide markets for the farmers and as long as markets exist, these farmers use any extraction means to satisfy the ever growing urban demand for food. For example, Atteridge [24] reported that charcoal consumption is very high in urban areas of Zambia, particularly Lusaka. However, this charcoal is never produced in the urban areas of Lusaka. It's a product from the surrounding rural areas and only transported to Lusaka. The existence of markets in urban areas is a driver of over-exploitation of forests in surrounding rural areas.

4.2 Food Utilization

The variants of food utilization largely affected by land resource governance are the nutritional value of food produced and food safety. The nutrient content such as calories, vitamins, proteins and micronutrients [25] derived from food can only be satisfied if a diverse variety of food is produced. The available land for food production plays a major role in both the amounts and diversity of food to be produced. Even agriculture intensification might in some cases give way to some degree of extensification to satisfy the nutritional requirements of a divergent population. For example, livestock rearing involving cattle, goats or sheep requires large pieces of land. The land requirement for such kind of livestock rearing in Zambia is more likely to be found under customary rather than statutory tenure. However, the lack of proper legal ownership to such lands is a big factor in the reduced number of people venturing into such production. Land ownership is also a factor in crop diversification as it discourages increased varieties of crops cultivated for the satisfaction of a variety of individuals with different nutritional requirements.

4.3 Food access

The ability to access quality food in preferred quantities is a function of price, income and individual preference. While political governance might affect all the variants of food access, land resource governance mostly affects levels of income and preferences. Prices for particular commodities may either be set by the government (as is the case in maize) or maybe determined by the interaction of market forces. In rural societies, the same socio-political capital influence regulations governing land resource use [26] to some extent may affect food access.

Incomes for most rural households are generated from their agriculture activities. Maize being the country's staple crop has dominated smallholder agriculture for decades [23; 27] and as such has been the major source of income for these farmers. General maize production has been on the increase since 2006/2007 agriculture season [23] with expected increase incomes, particularly for farmers selling to the government institution-Food Reserve Agency (FRA) which buys maize at a higher flow price than private buyers [28]. In a system where agriculture extensification is the main form of yield increase rather than intensification [23], the amounts of land allocated to the farmers has a direct impact on their incomes just as does property rights attached to the land they work. Farmers with smaller pieces of land might find it difficult to extensify and diversify. On the other hand, a lack of property rights to the land discourages innovation and long. This can have an effect on both the quality of the produce and sustainability of household incomes.

Food preferences for different individuals are influenced by social and cultural values and norms besides geographical location. Local cultures encouraging sustainable resource utilization will likely shape individual food preferences. The influence of local customs and geographical location on food access is seen in the distribution of production and consumption of cassava in Zambia. The northern parts of Zambia are cassava producers and consumers while in southern Zambia the crop is hardly cultivated [29] let alone consumed. A lack of proper taste has been cited as a reason for southerner's distaste for cassava. In the northern parts where the crop has been cultivated for centuries, such perceived lack of taste is not even an issue [27]. Decades of cassava consumption has made the northerners identified with cassava while the southerners do not care much for it. Other factors which influence preferences include religion, advertisement, mode of preparation, human capital, taste, local customs and gender of participants involved in labor force.

5. LAND RESOURCE GOVERNANCE FOR SUSTAINABLE LOCAL FOOD SYSTEMS

Governance of sustainable food systems is a case of sustainable management of the land resources which determines availability, utilization and access of food to both producing and non-producing communities. Most of these land resources are under customary tenure of which governance would involve rethinking the whole social-political system from policy to mechanisms set at local household levels. Below are suggestions for creating a robust governance for improving food systems:

5.1 Rethinking resource rights

There is a direct correlation between responsible ownership of a resource and property rights attached to the resource [30]. This implies that effective resource governance depends upon successful management of property rights and rights to resource ownership. These rights are central to comprehensive claims of local people who are the food producers [3]. They are often motivated to engage in long-term projects on land of which they have total ownership and have freedom to try out innovative approaches for improving food production. This produces sustainable food systems which are resource efficient, productive and adaptive to changing demands [31].

5.2 Devolution of powers

A study conducted by Hiron [32] on Ghana reported how decentralization has been viewed as effective means to managing land resources. However, he recognized the importance of engaging traditional authorities if the decentralization process would succeed [32]. In Zambia, current resource governance regimes involve a top-down approach with policies affecting local communities being run at national or even district level and expecting to work in different areas of the country and at all levels of society. However, communities have different social and economic dynamics and management using a one-size-fits-all approach has been a factor in lack of success recorded in resource management over time [2]. For example, the Farmers' Input Support Programme (FISP) in Zambia is a case in point. FISP is a government funded subsidy programme which provides inputs to beneficiary farmers [28]. Besides free maize and rice seeds, FISP supplies basal fertilizer and Top dressing fertilizer to beneficiary farmers. The same type of fertilizer is provided for all areas without regard for the soil fertility concerns farmers may face. While some areas might benefit from the supplied fertilizer, for other areas application of such fertilizer might prove wasteful as the soils might need other forms of management such as lime (CaO) for highly acidic environments.

A bottom-up management style will entail development and implementation of policies and approaches enabling locals to make decisions on resource utilization and management. This has a higher chance of success as the people utilizing the resources and affected by depletion of these resources at a lower level are charged with the responsibility of making decisions directly affecting them. The locals possess knowledge of local systems [33] besides their tacit indigenous knowledge achieved over time [34; 35] which is vital to achieving sustainability in food security. Devolution of power by the government should involve a genuine commitment to transfer decision-making, access to benefits and legally recognize the

rights of the locals, inclusive local structures and opportunities to enhance land resource based livelihoods [[2].

5.3 Regulating urban based demand for exploited resources

The commercial interplay involving urban demand for resources and rural people's ability to supply the resources has been a major factor in over-exploitation of rural based resources particularly forests. Forest encroachment and charcoal production are major culprits in forest exploitation. Empowering local management of these resources as well as cheaper and efficient energy provision for urban communities would highly reduce forest over-exploitation. Research into large-scale migration to green energy should be high on the governance agenda.

5.4 Encouraging conservation agriculture (CA) techniques among local producers

In recent decades, policy frameworks, practitioners and communities have given increased emphasis on conservation and restoration issues whether its involving forests [36], land or climate change. Global climatic changes affect smallholder food production [37] and national food security. Recent CA Studies in Zambia [38; 39] have confirmed that the practice increases smallholder farmer resilience towards impacts of global climatic changes as well as improve yields produced. The CA package to smallholder farmers involve a series of sound land husbandry practices which minimize soil disturbance, keep soils permanently covered with organic matter and sequentially rotate crops [40]. The practice not only improves soil fertility but also helps farmers increase their harvest. However, there has been a reported low rate of adoption of CA among smallholder farmers in Zambia [41] with many blaming the labor intensive nature of the practice (basin CA) [42]. Encouraging CA among the local producers helps promote agriculture intensification, restoration and discourages encroachment into new lands hence reduced forest degradation.

5.5 Access to enough land to ensure food security

Even though the amount of land under customary tenure in Zambia is still not well known [16], most of this land is inaccessible to smallholder farmers and is not used for food production [15]. Efforts in improving access to these lands are necessary for increased production. Securing rights to these lands will provide the needed motivation for improved production and innovative agriculture.

5.6 Land wrangles and conflict prevention

Reduced or restricted access to land leads to intensified competition for available land. Conflicts generally arise with the risk of 'losers' getting displaced. Conflicts are a hindrance to production and needs to be prevented. Clearly defined tenure rights to resources particularly in customary areas would reduce wrangles and prevent conflicts.

5.7 Building resilient food systems

Evans [43] identified five factors necessary for building resilient food system; assets, institutions and entitlements, knowledge and information, innovation and flexibility of foresight. Building resilience will therefore involve ownership of assets by individuals and communities and this could be in form of resources such as land or means to ensure livelihoods. Innovative institutional management is crucial in management of social-ecological systems [44]. This is because institutions and entitlements are central in ensuring individual rights to resources and access to assets for improved production. Knowledge and information in form of early warning systems, weather forecasts and extension services will ensure improved farmers productivity and resilience to shocks and stresses. Innovation encourages flexible and adaptable systems which can quickly respond to change. It provides an adaptation pathway for response to shocks and stressors [45]. It can also allow smallholder farmers to change farming systems to adapt to the felt change whether in the short-term or long-term. Ownership to resources encourages long-term

innovation among smallholder farmers. Knowledge and information is crucial to developing flexibility and foresight. Tacit knowledge accumulated through experience over time is crucial to building resilience among smallholder farmers [46].

Altieri [47] reported that the developing world's 1.4 billion resource poor farmers inhabiting marginal, risk-prone environments are yet to be touched by modern agriculture technology. The low levels of agricultural technological advancement among smallholder farmers means that resilience based on natural resource capital is more likely for these farmers as it provides them with a wider choice of resource components especially in more complex agro-ecological systems [48]. This enables these farmers to diversify their production systems enhancing their adaptation. This is because diversifying farming system makes them less vulnerable to shocks and hence enhances farmer adaptations to changed global conditions [49]. A simple agro-ecological system is less vulnerable to the impacts of variability and tends to be driven by specialized local farmers able to access local resources. This facilitates adaptation by local farmers by increasing resilience to shocks.

6. TOWARDS A SUSTAINABLE MANAGEMENT OF LOCAL NATURAL RESOURCES

Local natural resource governance (including land resources) begins with the identification of governance mechanisms operating at a local level (Figure 1) which influence resource utilization and livelihood value [1]. These mechanisms could be policies, institutions or processes influencing access to particular resources. Governance mechanisms can be identified at all levels, including village level where traditional governance structures are set up to regulate resource use. Local regulations and rules governing resource use at village level can pass for policy. Some traditional institutions may fall within or outside state structure [2] of which a distinction need to be made. Next is to establish natural resources and livelihood values and challenges related to access. This entails identifying all the livelihoods dependent on the available local natural resources and constraints related to access and utilization.

Natural resources in an area can then be identified as either conservational and/or consumable ones. While conservational resources also have consumable value, for management purposes these need to have restricted access while consumable ones sustain local livelihood. Regulating use of conservational resources can help prolong resource use and enhance sustainability. It can also help evaluate how governance is influencing and impacting on production, access and utilization of the available resources. An identification of opportunities to strengthen sustainable use of these resources can then be made. The purpose is to improve on the existing governance style while conserving some natural resources and enhancing livelihoods. This can be done by assessing areas requiring improvements such as information flow, increased innovation in production, improved resilience through crop diversification or methods of assessing livelihood indicators designed to measure long-term impacts. Implementation of the observed weaknesses in local natural resource governance should result in local natural resources being utilized for sustainable livelihoods anchoring sustainable food systems. Possible areas of natural resource governance assessment could be land and natural resource ownership, natural resource access and management, and natural resource service provision.

Various forces operational at local level can impact natural resource governance. NGOs, international agencies, entrepreneurs, beside government structures tend to influence and in many instances undermine traditional structures necessary for local level governance. Hence devolution of state powers is a cardinal step towards local resource governance. Existing gender, age or economic stratification within communities have the potential to influence the nature of resource control and could be sources of conflict. Rules and regulations developed locally can be enforced to ensure equity within the community and towards resource access. This would ensure equitable access and utilization of natural resources for sustainable food system governance.

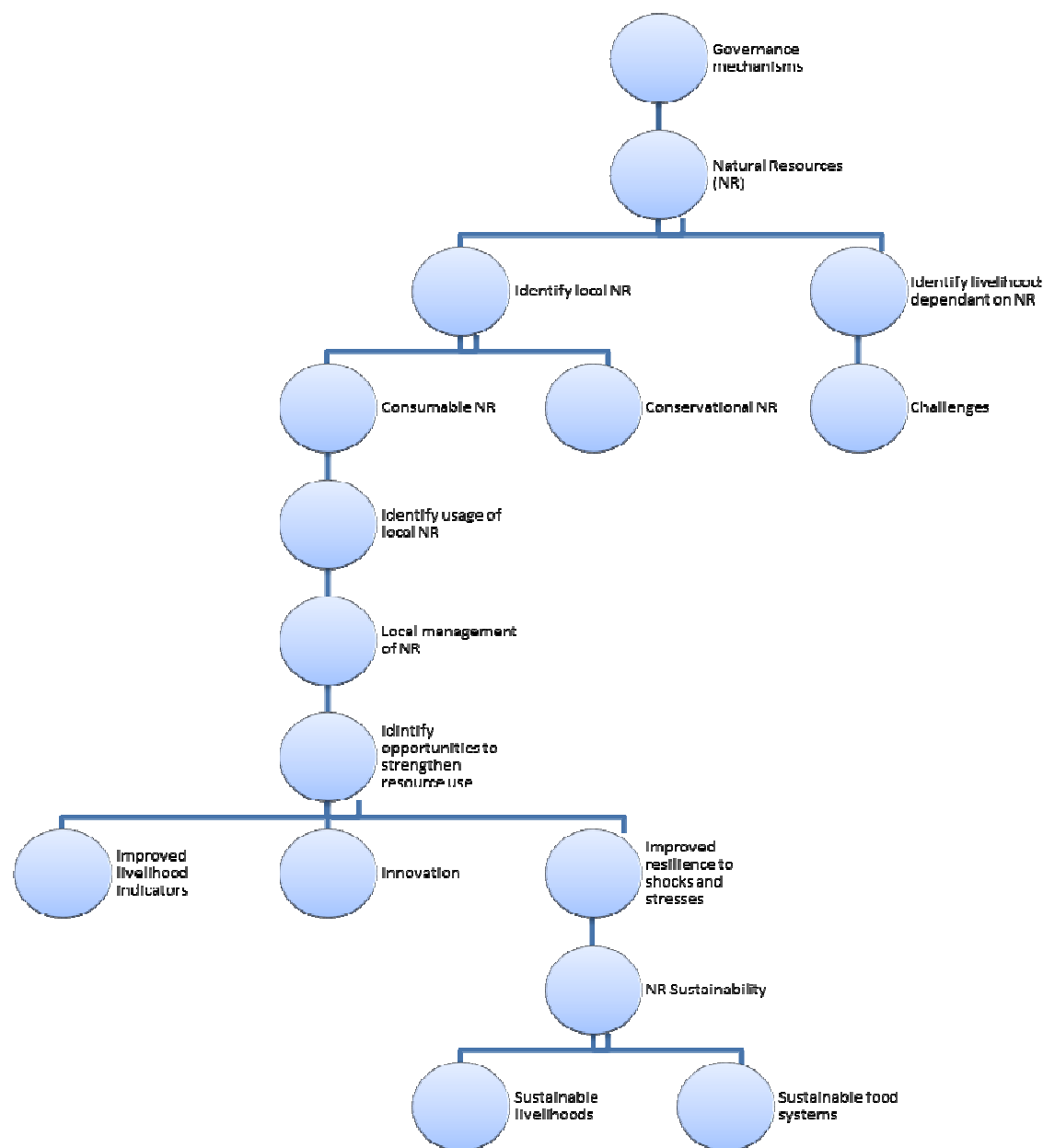


Fig. 1. Sustainable management of natural resources at local level

7. CONCLUSION

Land resource regimes in Zambia are either statutory or customary. Statutory managed resources have clearly defined property rights while customary resources are traditionally managed with individuals utilizing the resource not having exclusive rights to it. Most customary managed land resources are in rural areas and it is these resources that most food producers utilize. Most urban state lands are inhabited by non-food-producers. Natural resource management in Zambia has followed a top-down approach where one-size-fits-all by having a single policy produced at national level guide resource management at all levels down the chain. This strategy has been inefficient as different factors and dynamics have hindered efficiency resulting in below potential production for many customary resource owners. Developing strategies from bottom-up would entail the locally affected communities suggest

strategies that could work for their communities. This would be a more efficient management style as it would handle site specific issues. Identified governance issues to improve system performance include rethinking property rights to allow customary land owners to have exclusive leasehold of their land resources. To improve sustainability of food systems, resource governance should encourage innovation and long-term investment, devolution of powers of governing resources to the locals, regulation of urban demand for resources and building resilient food systems. In conclusion, land resource governance needs to embrace a bottom-up approach and encourage systems allowing for innovation, diversification and possible intensification in local food production.

REFERENCES

1. IUCN. Assessment of Natural Resource Governance in Garba Tula, Northern Kenya. UK AID, Final Report, May 2011.
2. Shackleton S, Campbell BM. Devolution in natural resource management: institutional arrangements and power shifts: a synthesis of case studies from southern Africa. Bogor, Indonesia: CIFOR; 2001.
3. Caulfield R A. Resource governance. In: Einarsson N, Nymand-Larsen J, Nilsson A, Young OR, editors. Arctic human development. Akureyri: Stefansson Arctic Institute; 2004:121–138.
4. Young OR. Creating Regimes: Arctic Accords and International Governance. Ithaca: Cornell Univ. Press; 1998.
5. Young OR. The Institutional Dimensions of Environmental Change: Fit, Interplay, and Scale. Cambridge: The MIT Press; 2002.
6. Berkes F, Folke C. Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience. New York: Cambridge University Press; 1998.
7. Haycox S. Frigid Embrace: Politics, Economics, and Environment in Alaska. Corvallis: Oregon State University Press; 2002.
8. McMichael P. Food system sustainability: Questions of environmental governance in the new world (dis)order. Global Environmental Change. 2011; 21(3): 804-812.
9. Thompson J, Scoones I. Addressing the dynamics of agri-food systems: an emerging agenda for social science research. Environmental Science and Policy. 2009; 12(4): 386-397.
10. GRZ. Land Policy document. Lusaka, Ministry of Lands: 1995.
11. GRZ. National policy on environment. Lusaka; Ministry of Tourism, Lands and Natural Resources: 2007.
12. ZEMA. The Environmental Management Act. EMA No. 12. Lusaka: Zambia Environmental Management Agency; 2011.
13. GRZ. Fifth National Development Plan 2006-2010. Lusaka; 2006.
14. Jayne TS, Zulu B, Kajoba G, Weber MT. Access to land and poverty reduction in rural Zambia: Connecting the policy issues. Working Paper No. 34. Lusaka; Food Security Research Project: 2008.

- 441 15. Chizyuka R, Kamona R, Ufwenuka C, Phiri M. Zambia: policies and strategies for agrarian reform
442 and rural development to secure and improve access to natural resources. National Report.
443 International Conference on Agrarian Reform and Rural Development (ICARRD): Porto Alegre,
444 Brazil; 7-10 March 2006.
- 445 16. FSPR. Access to land, food security and poverty reduction in rural Zambia: connecting the policy
446 issues. The Food Security Research Project and the Agricultural Consultative Forum; 2010.
- 447 17. Kabilika E. The status of customary land and how it affects the rights of indigenous local
448 communities. Submissions to the Committee on Agriculture and Lands (CAL). Caritas Zambia:
449 2010.
- 450 18. GRZ. Zambia: country study guide. Washington DC, International Business Publications; 2008.
- 451 19. Ericksen PJ, Ingram JSI, Liverman DM. 2009. Food security and global environmental change:
452 emerging challenges. *Environmental Science and Policy*. 2009; 12 (4): 373-377.
- 453 20. Feenstra GW. Local food systems and sustainable communities. *American Journal of Alternative*
454 *Agriculture*. 1997; 12(01): 28-36.
- 455 21. Simatele MCH. The impacts of structural adjustment on food production in Zambia. African
456 Economic Research Consortium research paper 159. Nairobi; AERC: 2006.
- 457 22. Saasa OS. Agricultural intensification in Zambia: The role of policies and policy processes. In:
458 Africa Food Crisis-The relevance of Asian models. University of Zambia and Lund University;
459 2003.
- 460 23. Sitko NJ, Chapoto A, Kabwe S, Tembo S, Hichaambwa M, Lubinda R, Chiwawa H, Mataa M,
461 Heck S, Nthani D. Technical compendium descriptive agricultural statistics and analysis for
462 Zambia in support of the USAID mission's feed the future strategic review. Lusaka: Food Security
463 Research Project Working Paper No. 52; 2011.
- 464 24. Atteridge A, Heneen M, Senyagwa J. Transforming household energy practices among charcoal
465 users in Lusaka, Zambia: a user-centred approach. Stockholm Environment Institute: 2013.
- 466 25. Young H. Nutrition and intervention strategies. In: Devereux S, Maxwell S, editors. Food Security
467 in Sub-Saharan Africa. ITDG: London; 2001.
- 468 26. Ericksen PJ. What is the vulnerability of a food system to global environmental change? *Ecology*
469 *and Society*. 2008; 13(2): 14.
- 470 27. Zulu B, Nijhoff TT, Jayne TS, Negassa A. Is the Glass Half-Empty or Half Full? An Analysis of
471 Agricultural Production Trends in Zambia. Working Paper No.3. Lusaka; Food Security Research
472 Project: 2000.
- 473 28. GRZ. Farmer Input Support Programme (FISP): Implementation manual 2013/2014 agricultural
474 season. Lusaka: Ministry of Agriculture and Livestock; 2013.
- 475 29. Poole ND, Chitundu M, Msoni R. Commercialization: A meta-approach for agricultural
476 development among smallholder farmers in Africa. *Food Policy*. 2013; 41:155-165.
- 477 30. Hardin G. The Tragedy of the Commons. *Science*. 1968; 162(3859): 1243-1248.
- 478 31. Fresco LO. Challenges for food system adaptation today and tomorrow. *Environmental Science*
479 *and Policy*. 2009; 12(4): 378-385.

- 480 32. Hirons M. Decentralizing natural resource governance in Ghana: Critical reflections on the
481 artisanal and small-scale mining sector. *Futures*. 2014; 62: 21-31.
- 482 33. Kates RW, Clark WC, Corell R, Hall JM, Jaeger CC, Lowe I, McCarthy JJ et al. Environment and
483 development Sustainability science. *Science*. 2001; 292 (5517): 641-2.
- 484 34. Boateng W. Knowledge management working tool for agricultural extension practice: the case of
485 Ghana. *Knowledge Management for Development Journal*. 2006; 2(3): 19-29.
- 486 35. Lwoga ET, Ngulube P, Stilwell C. Understanding indigenous knowledge: Bridging the knowledge
487 gap through a knowledge creation model for agricultural development. *South African Journal of*
488 *Information Management*. 2010; 12(1): 1-8.
- 489 36. Buizer M, Humphreys D, de Jong W. Climate change and deforestation: The evolution of an
490 intersecting policy domain. *Environmental Science and Policy*. 2014; 35: 1-11.
- 491 37. Bazzaz FA, Sombroek WG. Global climatic change and agricultural production: An assessment of
492 current knowledge and critical gaps. Rome: Food and Agriculture Organization of the United
493 Nations (FAO); 2005.
- 494 38. Nyanga PH, Johnsen FH, Aune JB, Kalinda TH. Smallholder Farmers' Perceptions of Climate
495 Change and Conservation Agriculture: Evidence from Zambia. *Journal of Sustainable*
496 *Development*. 2011; 4(4): 73-85.
- 497 39. Umar BB, Nyanga PH. Conservation agriculture and rainfall variability in Zambia: is CA a
498 promising option for responding to droughts and floods? 5th World Conference on Conservation
499 Agriculture. Brisbane Australia, WCCA/Farming Systems Design; 2011.
- 500 40. Chappell A, Agnew CT. Modeling climate change in West African Sahel rainfall (1931–90) as an
501 artifact of changing station locations. *International Journal of Climatology*. 2004; 24(5): 547-554.
- 502 41. Arslan A, McCarthy N, Lipper L, Asfaw S, Cattaneo A. Adoption and intensity of adoption of
503 conservation farming practices in Zambia. *Agriculture, Ecosystems and Environment*. 2014;
504 187:72-86.
- 505 42. Mubanga KH, Ferguson W. Assessment of food sufficiency among smallholder farmers in
506 Choma, Zambia. *Journal of Food Security*. 2016: (In Press).
- 507 43. Evans A. Governance for a resilient food system. Oxfam Discussion paper. New York: Oxfam;
508 June 2011.
- 509 44. Armitage DR, Ryan P, Fikret B, Robert IA, Anthony TC, Iain JD, Alan PD et al. Adaptive co-
510 management for social–ecological complexity. *Frontiers in Ecology and the Environment*. 2009; 7
511 (2):95-102.
- 512 45. Câmpeanu CN, Fazey I, Adaptation and pathways of change and response: A case study from
513 Eastern Europe. *Global Environmental Change*. 2014; 28:351-367.
- 514 46. Mubanga KH, Umar BB. Smallholder Farmers' Responses to Rainfall Variability and Soil Fertility
515 Problems by the Use of Indigenous Knowledge in Chipopo, Southern Zambia. *Journal of*
516 *Agricultural Science*. 2014; 6(6): 75-85.
- 517 47. Altieri MA. Agro-ecology: the science of natural resource management for poor farmers in
518 marginal environments. *Agriculture, Ecosystems and Environment*. 2002; 93(1–3): 1-24.

- 519 48. Vandermeer J, Noordwijk M, Anderson J, Ong C, Perfecto I. Global change and multi-species
520 agro ecosystems- concepts and issues. Agriculture, Ecosystems and Environment. 1998; 67: 1-
521 22.
- 522 49. Verchot LV, Noordwijk M, Kandji S, Tomich T, Ong C, Albrecht A, Mackensen J, Bantilan C,
523 Anupama KV, Palm C. Climate change: linking adaptation and mitigation through agroforestry.
524 Mitigation and Adaptation Strategies for Global Change. 2007; 12 (5):901-918.
- 525