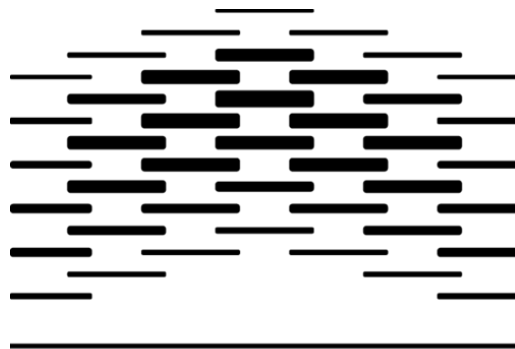


Running head: INDIGENOUS KNOWLEDGES IN AGRICULTURAL SCIENCE

Rosalia Sakayombo

INDIGENOUS KNOWLEDGES IN AGRICULTURAL SCIENCE

An Exploration into the Integration of Indigenous Knowledges in the Teaching
of Agricultural Science in selected Secondary Schools in Zambia.



**HØGSKOLEN I OSLO
OG AKERSHUS**

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Abstract

This thesis explores the integration of indigenous knowledges (IKs) into the teaching of agricultural science as illustrated by the cases of selected secondary schools in the Southern province of Zambia. The need to integrate IKs in agricultural science education in Zambia to reflect the local cultural settings cannot be over emphasised. The agricultural science syllabus in secondary schools is Eurocentric since the current educational policies are situated deeply in Western hegemonic epistemology. In doing so, it marginalises IKs which are misconceived as irrational, backward and primitive. Since research has shown that IKs are being gradually recognised as an alternative knowledge that can be used in the preservation of the environment (Warren et al.; 1989; Sillitoe, 2000; Breidlid, 2013), integrating them into agricultural science teaching is, therefore, meant to bridge the gap between the school and the learners' home environment, and make learning more relevant. The respondents in this study were purposefully selected and interviewed in order to gain insights into how IKs are viewed and integrated into their agricultural practice and teaching. Challenges experienced in relation to the integration process were also discussed.

In order to obtain the data; a qualitative research strategy was employed with interviews being its primary tool. Other instruments were content analysis of the Zambia junior and senior secondary school agricultural science syllabus and non participant class observations. Thereafter, the analysis of data was conducted with the use of grounded theory. Theories of modernity and tradition, modernisation, the global architecture of education and other concepts were used to discuss and interpret the findings.

The study revealed that most of the respondents had a general understanding of IKs. However, the informants admitted to be a product of Western education themselves and, therefore, exhibited some negative attitudes towards IKs implicitly continuing the marginalisation of IKs. It may be then concluded that IKs to a large extent have not been integrated in the teaching of agricultural science in the secondary schools in Zambia. In addition, the long history of interacting with the Westernised curriculum seems to have made most Zambians, especially its younger generation, unfavourable to IKs, instead wanting to maintain status quo. However, with the realisation of the land devastation caused by

conventional farming methods, some people are starting to rethink the way agricultural science is taught.

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Abbreviations

AEO	Agricultural Extension Officer
CDC	Curriculum Development Centre
CF	Conservation Farming
ECZ	Environmental Council of Zambia
ECZ	Examinations Council of Zambia
ESD	Education for Sustainable Development
FAO	Food and Agricultural Organisation
FNDP	First National Development Plan
GMOs	Genetically Modified Organisms
HIV/AIDS	Human Immune Virus/ Acquired Immune Deficiency Syndrome
ICT	Information Communication Technology
IKs	Indigenous knowledges
IK	Indigenous knowledge
JETS	Junior Engineers Technicians and Scientists
KATC	Kasisi Agricultural Training Centre
UNESCO	United Nations Education Scientific and Cultural Organisation
NGOs	Non Governmental Organisations

1 Introduction

Agriculture in Zambia like in any country is a main source of food. In his book ‘The world we wish to see’ Amin and Amirez (2008, p. 119) construe “food security as a right that must be granted and a lever that allows countries to recover national sovereignty in all areas.” Therefore, to teach agricultural science in school and in the classroom is to teach learners how to grow or produce food.

1.1 Go back to the land

“Go back to the land,” a slogan that Kaunda created, was a long term strategy to keep the young able bodied men and women in rural areas to enhance capacity and resource utilization of human and natural capital with which the rural areas are endowed with. This was coinciding with Julius Nyerere’s (Tanzania) philosophy of self-reliance (Peter Snelson, 1974).

One of the greatest challenges of the first Zambian (republican) government under the leadership of President Kaunda at independence in 1964, was the ‘exodus’ of the population from rural to urban areas. The fast growing population in the urban areas along the line of rail from Livingstone to the Copperbelt towns created a serious crisis in quality service delivery in education, health, housing, water, sanitation and transport with problems related to unemployment, crime and food security (Mwanakatwe, 1974).

As an immediate response and long term strategy, the Zambian government adopted policy measures that guaranteed food security and affordability. To feed the growing population, it was essential to achieve self reliance in food production and as well as enhancing its availability and affordability on a sustainable basis. This could only be achieved if the phenomenon of ‘rural exodus’ was stemmed. About ninety four percent of the landmass in Zambia was and is still under customary tenure. The able bodied young men and women who needed to increase rural production and contribute to the diversification and growth of the national economy constituted the majority of people who were deserting the abundant rich natural resources for the illusory bright lights in the cities but ended up being economic refugees in the urban enclaves. These concerns saw the birth of both the production unit and agricultural science in schools as a national phenomenon.

The First National Development (FNDP) in 1966, emphasised the need to relate the secondary education syllabus to technical and commercial fields, hence giving a new place to agricultural science by encouraging the formation of Young Farmers Clubs in every secondary school and introducing agricultural science as an 'O' level subject (Mwanakatwe, 1974). This was followed by another most significant development in 1966 which was the radical revision of the junior secondary school syllabuses in order to bring the content into closer relation to the needs of the Zambian learners. Agricultural science therefore was reintroduced in both the junior and senior Secondary schools' curricula. However, agricultural science was mostly associated with rural life as its importance was related to demonstrating to pupils especially in rural secondary schools the possibilities and opportunities of rural life in a practical way (Mwanakatwe, 1974, p. 134). This has remained as a stigma on the subject, which I later refer to in the chapter 6 as one of the challenges in the integration of IKs in the teaching of agricultural science because some learners associate the subject with manual labour.

1.2 Context of the study

Zambia like all other African countries is part of the current economic and ecological crisis, evidenced in the changing weather patterns and degradation of the earth that is posing a great challenge to agricultural output. Breidlid (2013) postulates an "urgent need to start new conversations about the world and man" (p.54). This is because in this century, "humanity is more at risk than ever before from misapplication of science and the environmental pressures induced by collective human actions" (Rees, 2004, p. 186 as cited in Breidlid, 2013, p. 22). Some scholars (Kincheloe, 2008; Breidlid, 2013) suggest the need to deconstruct Western science's obsession with controlling nature using alternative knowledges. Therefore, there is no more appropriate time than in this 21st Century when there is a need to interrogate the viability of Indigenous knowledges as a potential tool for sustainable development.

While IKs have been seen to have the potential in sustainable development, the present agricultural science syllabus in secondary schools has not catered for them adequately to allow teachers integrate IKs in their teaching. The National Policy Document on education in

Zambia states that one of its main goals is to produce a learner capable of “appreciating the relationship between scientific thought, action and technology on one hand, and the sustenance of the quality of life on the other.” This learner should also be capable of “appreciating Zambia’s ethnic cultures, customs and traditions while participating in the preservation of the ecosystems of their immediate and distant environments” (Educating Our Future, 1996, p. 5).

It is hoped that this learner would be capable of taking care of land by using traditional knowledge and methods of preserving it. This would help alleviating the problem of land destruction as seen in the Southern Province where land has been destroyed due to conventional farming methods, which according to Haggblade and Tembo (2003) has led the province to no longer providing the much needed food security for the country. Haggblade and Tembo (2003) justify the need for use of IKs in agricultural science when they write;

Crop yields in Zambia are very low and food insecurity has become a widespread problem despite the fact that the country has a small population with abundant land. This is because the conventional farming methods that rely on mining out the fertility provided by nature, land degradation and deforestation are on the rise in the country (p. 9).

Conventional¹ agriculture therefore is appreciated for its mass production and reduced labour inputs. However, there is a deep realisation of the destruction it leaves in its trail because of use of inorganic fertilizers, chemical pesticides and heavy mechanisation. Some people are becoming aware that the traditional methods of farming have their own limitations but may not be as destructive to the soils and the environment as the latter.

This study aims at investigating the integration of Indigenous Knowledges (IKs) in the teaching of agricultural Science. It will focus on the relationship between indigenous knowledges and agricultural science. It will also attempt “to interrogate the dilemma of exclusively introducing Western based agricultural science knowledge in a cultural context based on indigenous epistemology.

This leads to Breidlid’s (2013) argument about the “need for communication between the various knowledge systems, not by opposing everything Western knowledge systems and education represent but by creating dialogue between different concepts and practices of

¹ Conventional agriculture: “Farming practices that involve the use of chemical fertilizers, pesticides and machinery”(Park, 2013, p. 97).

knowledges” (p.35). Therefore indigenous knowledges which focus on the relationship of human beings among themselves and in relation to nature become ideal in solving the problems related to the destruction of the land which considering that knowledge produced in the West could be equally important if integrated with it (Semali & Kincheloe, 1999).

Research on integration of IKs into school agricultural science syllabus is one area that has not yet been interrogated in the Zambian academia. Therefore this research is just the beginning of the much needed research in the field of indigenous knowledges in agriculture. Integrating IKs into school, aims at educating younger people to bring about a generation of people that are environmentally conscious and will interact with the environment with a sense of protecting and preserving it.

1.3 Rationale of the study

It is believed that the introduction of Agricultural science as a subject in the Zambian education system was not only to equip learners with practical skills but also a quest towards Education for Sustainable Development (ESD). Education for sustainable development is said to promote a holistic approach to education within which the classroom is complemented by real opportunities for learner participation in environmentally sustainable systems in the school. Moreover, it is a vision of education that seeks to empower people to assume responsibility for creating a sustainable future.

However, Zambia like most other African countries has a Eurocentric curriculum which does not include indigenous knowledges of the learners, therefore ignoring their context. Scholars like Breidlid (2013) suggest the need to transform classrooms in the South into decolonising spaces, hence the need for integration of IKs. In Zambia, where the people seem to enjoy their cognitive colonisation stemming from a long history of an education system run on Western hegemonic epistemology, any discussion about integration of IKs into the teaching and learning cannot go without challenges.

But, as long as Zambia chases after sustainable development, while the agricultural science curriculum still remains fully Eurocentric and sidelines the IKs, then Zambia’s development has a long way to go. Several scholars argue that IKs contain and offer knowledge that Western science has not yet learnt to produce (Breidlid, 2013; Botha, 2012; Corsiglia, J. & Snively, G., 2001). Oguniyi and Hewson assert this by stating that; “science with its

absolute power and self justification at the exclusion of other ways of knowing has also resulted in countless failed development initiatives around the world of which the most obvious and current is the environmental crisis threatening the very existence of the entire human race” (2008, p.160). It is against this background that the integration of IKs in the Zambian agricultural science syllabus becomes an urgent need.

Moreover, I had a personal motivation in this study as mentioned in the methodology chapter that the course work in the 2012-2014 multicultural class was an eye opener for me regarding issues of the environment and the indigenous knowledges. From the lectures and class interaction, I developed a passion for the environmental issues. That reminded me about what was happening to the farming block in the Southern province where I have worked for so many years and how the farmers are struggling with reduced yields due to the degradation of land. I had not really questioned the developing negative trends on the land. Therefore this research allowed me to go back to schools and to the farming community to ask questions that I wouldn't have asked before and explore the farming traditions of the Tonga people, that made them prosper for generations and see how these traditions were or could be integrated into the school curriculum to ensure preservation of the farm land and try to return and retain its productivity.

Though the area of IKs and agriculture is wide and beyond the scope of this master thesis, this research was narrowed down to the integration of IKs into teaching of agricultural science in Secondary schools in the light of degraded soils in the province where this research was conducted. I set the following objectives for myself, to help throw light on the topic under study

1.4 Research objectives

1. To explore the views of actors involved in the agriculture sector on how they relate to IKs in relation to agriculture;
2. To examine the content of indigenous knowledges (IKs) in the agricultural science syllabus;
3. To explore how teachers, learners and curriculum developers view the place of IKs in agricultural science;

To achieve the above objectives, the following research questions were asked as a guide to the data collection process.

1.5 Research Questions

1. How do the ordinary farmers (village elder) and the agricultural extension officer view indigenous knowledges in relation to agriculture?
2. What content of the agricultural science syllabus forms body of knowledge that can be identified as indigenous knowledges? How do teachers and learners view this knowledge? Why do they hold these views?
3. To what extent/in what way are indigenous knowledges (IKs) recognised and included in the teaching of agricultural science? What are the challenges of including IKs in the teaching of agricultural science?
4. How do the subject specialists at the Curriculum Development Centre view the Agricultural Science syllabus in relation to indigenous knowledges? Why do they hold these views?

1.6 Significance of the study

While issues of integration of IKs into the curriculum are not easy and broader than the scope of this thesis, it is hoped that this study will contribute to the general area of education and teaching methods. It is also hoped that it will provide information on the place of IKs in the teaching and learning of agricultural science and in view of preservation of the environment, prompt a change in the attitudes of curriculum developers to reconsider the content of the agricultural science syllabus and design a culturally sensitive syllabus that allows both knowledges to co-exist.

The study's orientation and contribution seems to be in line with Breidlid, Semali and Kincheloe's views on indigenous knowledges. These two writers argue that when indigenous

knowledges are properly integrated into the school system, their encounter with Western hegemonic education makes educators and their students appreciate and critically think about schools and what they stand for (Bredlid, 2013; Semali & Kincheloe, 1999). Bredlid (2013) further argues that most science syllabi in the South are Eurocentric and hegemonic, leading to cognitive alienation of students from “their home environment by introducing them to alien culture and epistemology in school” (p. 55). Integration of IKs into the teaching of agricultural science is aimed at bridging the gap between the teacher and learner’s home environment and the school. In the long run creating sensitivity to traditional customs and social norms among community members, leading to a culturally appropriate curriculum therefore rendering education relevant (Asabere-Ameyaw, Dei, & Raheem, 2012, Bredlid, 2013, Semali & Kincheloe, 1999).

1.7 Outline of the thesis

The first chapter of this thesis is an introductory chapter that give the background, explains the significance of this study, the objectives and research questions that the study intends to address and answer.

The second chapter presents the conceptual and theoretical framework of the study that arose from the data and grounds the study. Since my interest is the integration of IKs into agricultural science, the distinction between the two knowledge systems is brought out. While other theories and concepts to help analyse data are discussed, Gyekye’s modernity and tradition is discussed as an overarching framework which is perceived by the respondents as a dichotomy that largely influences how agricultural choices are made in communities and how school teachers are influenced on which knowledge to emphasise.

In chapter 3 which is the methodology, choices of the research strategy and methods are defended and data collection methods and analysis of the data are explained. Issues of authenticity and trustworthiness of the research are also discussed.

Chapter 4 is the presentation of the findings of the study. In chapter 5, the findings from the data collected through semi-structured interviews, non participant observations and content of the Zambian agricultural science syllabus are discussed and analysed in the light of the theories elaborated from chapter 2.

The final chapter (6) presents a conclusion of the whole study by highlighting the challenges encountered in the integration of indigenous knowledges in agricultural science as brought out by respondents. Recommendations for possible further research are also discussed.

Having discussed the outline of this thesis, the next chapter therefore goes into the theoretical and conceptual framework that will be used to discuss the findings of this study.

2 Conceptual and Theoretical Framework

Globally, we inhabit this earth and survive daily due to an environment that provides oxygen to breath, food to eat, and water to drink. Our needs are universally similar, no matter the language spoken, the location of residence or the daily lived experiences that constitute life on earth. Humans strive to live and learn each day, sometimes in formal settings and often within informal settings. Admittedly, the quality of life can vary as we increase our knowledge and skills via learning, education and experience. (Kulnieks, Longboat, & Young, 2013, p. 21)

The topic of this thesis as already pointed out in the introductory chapter is to explore the integration of indigenous knowledges in the teaching of agricultural science in Zambian schools. This is in the light of environmental degradation and deterioration of land especially in the Southern province which was formerly the country's bread basket.

This chapter presents the concepts and theory that form the framework that will be used to analyse the findings of my fieldwork.

Since agriculture and indigenous knowledges are the main focus of this thesis, I begin by discussing the concepts of tradition and modernity using Kwame Gyekye's (1997) arguments. The fieldwork revealed that there is a tension between my respondents understanding of the concept as it is viewed as a binary paradigm. Modernity seems to influence most of the agricultural decisions and attitudes towards integration of indigenous knowledges into agricultural science.

The chapter then goes on to explore the modernisation theory in agricultural science as part of modernity. Agriculture as a modern construct is also discussed and since this thesis is about the integration of IKs into the teaching of agricultural science, the concept of indigenous knowledges is discussed as a major concept and how it is viewed as a type of knowledge. Then the relationship between IKs and agriculture is explored.

Since the integration of IKs into agricultural science is discussed within the context of teaching in school, the global architecture of education as a concept and its influence on the curriculum is explored.

The next section will discuss concepts of modernity and tradition as they influence the ways Zambians view agricultural practices and make choices.

2.1 Modernity and Tradition

Modernity and tradition are two concepts that are relevant to this study because they are often perceived as polar paradigms. These concepts have influence on how people perceive culture and make choices, and are very pertinent in relation to agricultural science in a Zambian context.

The term 'tradition' derives its etymology from the Latin word, 'traditum' meaning that which has been handed down from the 'past' generations. Fleischacker (1992 as cited in Gyekye, 1997, p. 219) defines tradition as a "set of customs passed down over generations, and a set of beliefs and values endorsing those customs." Acton the British philosopher in Gyekye (1997, p. 219) gives an added element - 'authority' and has to be referred to without argument. Gyekye however argues that tradition is not just handed down because that which is simply handed down can be rejected before it evolves into a tradition. Therefore, tradition is "any cultural product that was created or pursued by past generations and having been accepted and preserved in whole or in part by successive generations has been maintained to the present" (p.271). I can relate this definition to the Tonga people and the way they relate to their farming environment.

The Tonga people of the Southern province among whom the field work was conducted, are the indigenous people whose livelihoods have always been dependent on the land as farmers and pastoralists. The fact that these people have a great attachment to the land and do not see themselves separate from the land validates belief and confidence in their concept of the environment as a determinant of culture and behaviour. They learn their core values of respect, reciprocity and responsibility towards the earth through what can be termed "learning from the earth" using gifts of perception and understanding acquired from generations of practice and observing their mothers, fathers, significant others and the earth. Inherent in their belief is the fact that the whole creation is inspired, full of life and is sacred. Life is not viewed in an individualistic way but in mutuality and "all connectedness." Kulnieks et al., (2013, p. 67) describes "deep knowledge of ways of water, stars, medicine, food, animals, weather, winds that are framed from within our spiritual knowledge, where there is no false separation of spirit and matter of science and religion." Inherited traditions, however, need scrutiny and refinement not as a way of undermining their worth but to make them adaptable to the contemporary cultural population (p.222). Since a tradition controls and influences the life of 'a people,' it is imperative that it be reanimated. Breidlid (2013) argues that traditions

are not static but shaped in synergy with other values and at the same time modernity is negotiated using a set of traditional values “...traditions are open to human agency” (p. 38).

Modernity is a difficult term to define because of its complexity. Modernity’s key concepts are the individual, rationality and “progress” and can be viewed as “Institutions and modes of behaviour established in post feudal Europe but which in the 20th century have increasingly become world historical in their impact and are characterised by industrialisation and capitalism” (Giddens, 1990, p. 14). Gyekye (1997, p. 264) defines modernity as the ‘hub’ of “consultation for the non western societies wanting to gain inspiration and knowledge for models of thought and action for developing their societies and ways of transiting into modernity.”

In this digital age, like in all the other parts of the world, Zambian children even in the remotest tradition oriented cultures can now access information through various information technologies – mobile phones, radios, computers etc. This is automatically creating a conceptual and moral gap between generations. Zambian learners are now often caught between two worlds, that of their parents and grandparents and that of the consumerism and materialism of the West. The parents, grandparents, church leaders, village elders’ perceptions and highest expressions of the indigenous culture are constantly being challenged by what is perceived as individual progress, wealth and other conveniences that define modern life styles.

Most schools are promoting what needs to be inculcated in order to engage with “progress” and more technologically work dependent culture. Teaching of agricultural science cannot only teach about IKs about farming and how to live sustainably within the limits of the local environment, instead, agricultural science teachers need to introduce students to cultural forces that are promoting technological and economic globalisation. Since learners can access most of the information they need, agricultural science teachers as mentors need to provide learners with opportunities for students to ask questions about similarities and differences between their own traditions and those of the West, relying on Western ways of thinking and doing things and uses of technology. Actually what exists in most Zambian school going children perceive a dichotomy of the two knowledge systems.

This apparent dichotomy of modernity and traditional knowledge systems has been well argued out by Gyekye (1997) on several grounds. He argues that the notion of polarity is

premised on false grounds since “every society in our modern world is ‘traditional’ in as much as it maintains and cherishes values, practices, outlooks and institutions” inherited from the previous generations. There is a presence of ancestral elements in a modern society, because “every society in the modern world inherits ancestral cultural values” therefore modernity is not a total rejection of the past (p.217). From the responses from the fieldwork as already alluded to, the dichotomy of the two knowledge system nevertheless exists in the Zambians minds (as evidenced from the findings in chapter 4) and there is a clear indication of which knowledge system is superior and preferred. The integration of indigenous knowledges in the teaching of agricultural science in the Zambian schools depends not only on the government support and funding but on the attitudes, the mindset and aspirations of the Zambian people themselves.

Agriculture is regarded as a traditional subject in comparison to others like mathematics, science and English language that are considered as core-subjects. The Zambian education policy document ‘Educating Our Future’ (1996) reinforces this as it states;

Science and technology have had a radical impact on Zambia’s economy and on the way of life of almost every one of her people. Increasingly, the ability to think scientifically and to understand a scientific process is becoming a condition for survival....the curriculum must take this into account (p.35).

As modernity is associated with science and technology, being technical becomes more attractive as a choice of operating and problematises the integration of IKs into agricultural science as will later be discussed in the analysis chapter. However some scholars question the type of modernity that is only qualified by economic success and technological advancement (Chabal & Daloz, 1999).

While Giddens (1990) idea of modernity and tradition seems to suggest that tradition and modernity are polar ideas, however, Crew and Harrison (1999) argue that creating a dichotomy implies that indigenous knowledges are grounded in such different philosophical foundations from the West that communication between western knowledge and indigenous knowledges is in fact impossible. Serpell’s (2010) view of using metaphors to bridge cross cultural communication declares this premise invalid. He claims that trans-cultural commonality always exists and can be a basis for communication between cultures that have different perspectives. In today’s globalised world where there is a continuous movement of ideas, no human culture is pure, even traditional societies are dynamic and undergo change

except the pace of change varies from society to society but it does not mean that a society with “much slower rate of development change is static or unchanging or resistant to change or resiliently traditional.” A slower rate of change is still change (Gyekye, 1997, p.217). Africa is changing but at its own pace (Chabal & Daloz, 1999).

Furthermore, Gyekye (1997) points out that the dichotomy of modernity and tradition brings out two schools of thought, the revivalists and anti-revivalists – what he calls the ‘African predicament.’ This predicament may be interpreted as the crossroads between modernity and tradition. There are many reasons that have led to this predicament, whereas for some people, what stands out is an (alleged) “neglect of traditional cultural values of African societies in matters of development and creation of African modernity” (Gyekye, 1997, p.233). Revivalists being those who advocate for “a return to the cultural past” (p.233) which Gyekye (1997) illustrate by referring to N. K. Nzobo and his philosophy called – ‘Sankofa’ (in the Akan language of Ghana). ‘Sankofa’ entails a “necessary journey into the past of our indigenous culture so that we can march into the future with confidence and with a sense of commitment to our cultural heritage” (p.233). Modernists, on the other hand, do not subscribe to the revivalist stance, as they argue that;

Traditional cultural values cannot be accommodated by the mindset of the modern scientific culture and so cannot be reconciled with it. If Africans are to “catch up” with the advanced industrialised countries of the world, they must abandon a great part, if not the whole of their cultural heritage which is pre-scientific and can boast only of primitive or simple technology (Gyekye, 1997, p. 235).

Gyekye (1997) illustrates this with reference to two African philosophers who are advocates of anti-revivalism namely Marcien Towa of Cameroon and Paulin Hountondji of Benin “both of whom denounce any appeal to the past” (p. 235).

The next section discusses the modernisation theory and how its definition of civilisation is influencing agricultural innovations and teaching of agricultural science in Zambian schools.

2.2 Modernisation Theory in Agricultural Science

There are many proponents of modernisation theory. For Sorensen (2001) these include; Walter Rostow, W.A Lewis, Talcott Parsons and Daniel Lerner. According to this theory, development in technology, agricultural production for trade and industrialisation depends on a mobile labour force that is introduced by modern methods which under developed countries

will use in strengthening their economies to reach “progress.” However, the modernisation theory as we know it today emerged after the French and English revolutions (Fägerlind & Saha, 1989) even though the modernisation discourse extends to periods earlier than that. Tucker (1999) recounts how the League of Nations in 1919 implicitly gave power to the developed nations to dominate lesser advanced nations especially in Africa in the name of educating them about civilisation. This kind of thinking elevated modernisation to a status of a universal goal that devalued other world views and viewed them as ‘primitive,’ ‘backward’ and ‘traditional.’ The justification for this was development of a modern economy and a modern state that was hinged on scientific, innovative, dynamic and future oriented values characteristic of modernity. Indigenous culture on the other hand was perceived as rural, agrarian, pre-scientific, bound by perceptions of the past and resistant to change (Gyekye, 1997). Moreover, this theory undermines traditional values of collectivism or community and favours individualism, all the characteristics that are at odds with the African world view and “development.”

I found this theory relevant to my study because it emphasises economic development and the need to come up with a certain kind of individual equipped with a coherent package of skills and values, motives and attitudes uniquely well adapted to the tasks of building, expanding and maintaining a modern industrialised society. The methods of moulding individuals who “fit the description has been incorporated into the design of various school curricula” (Serpell, 2010, p.16). The teaching of agriculture in secondary schools in Zambia seems modelled on this premise and the quest to modernise is reflected in the *Zambian Education Policy* document, ‘*Educating Our Future*’ (1996, p. 35) which states that; “the scientific outlook is recommended as a hallmark of the approach to problem solving.”

It is evident that the way agricultural science is taught in different schools around the world is regarded as a source of economic progress, transmission of culture from one generation to the next and promotion of the learners’ intellectual and moral development. It is also hoped that the personal growth would enhance the learners understanding of their culture and help them build upon their heritage, as they discover improved ways of managing the environment. However, Serpell (2010) argues that “in practice educational programmes have consistently fallen short of the very agenda they stand for” (p.1).

In a research that Serpell carried out among the Chewa people in Eastern Zambia, one of the challenges he encountered was the parents bemoaning the alienating influence of the Western

packaged kind of schooling that made learners come out of the school without reading skills. This is a typical example of the modernisation theory and its effects on schooling. This kind of schooling tends not to be in sync with the learners' home experience. Breidlid supports this view by stating that: "the epistemological transfer apart from its consequences nationally or internationally impacts on school quality and contributes to alienating students in the South cognitively from the home environment by introducing them to alien culture and epistemology in school" (Breidlid, 2013, p. 54).

According to Warren (1991) the hallmark of a conventional agricultural framework is efficiency and mass production. This draws on practices involving use of chemicals for control of weeds and preservation of commodities, inorganic fertilizers, genetically modified seeds, food processing and other production technologies that require understanding of modern science that school should impart. Moreover, schooling is supposed to change the way farmers think about solving agricultural problems, impart new knowledge that would not be accessed from social experience and skills for accessing information from texts and other sources (Warren, Slikkerveer, & Titilola, 1989). However, appreciation of the positive influences of modern agricultural production techniques, does not take away Western science's imposition and pressure on the need to teach and use these agricultural productive techniques as if they are the only way to efficiency. Some scholars are saying that in the wake of declining agricultural output there is need to rethink how agricultural science is taught. This idea will be further discussed in the analysis chapter.

Gyekye (1997) points out how "for many scholars modernisation means 'Westernisation'-taking on values and ideas and institutions of the West" (p. 274). Most African countries through their long contacts with Westernism have voluntarily or involuntarily acquired Western values and institutions without necessarily becoming modernised or industrialised. The transfer of agricultural knowledge and technologies from the North to the South and the hegemony inherent in the Western agricultural knowledge makes integration between the IKs and Western knowledge problematic for the local people among whom this field work was carried out because the flow of ideas is one sided. Sillitoe (2000) argues that the 'top down' methods of information and technology transfers in agriculture that have not taken into consideration the IKs of the people involved have been problematic leading to failure of most agricultural development projects in the South. He instead advocates for the bottom-up approach which draws on the local people's involvement that through use of their own

knowledge and experience are able to identify their problems and in consultation with them be able to make decisions. However, “the bottom up approach does not mean to deny the virtues of the scientific knowledge system and to throw out the many successes and experiences that have been acquired through science. The first step would be to integrate the two knowledge systems” (Warren et al., 1991, p. 32).

In the face of general stagnation in agricultural production attributed to degradation of the soil and the environment, relevance of an education system to the present needs is cardinal to countering the environmental crisis in Zambia especially for the future generations. Breidlid (2013) contends that education systems in the South have been swallowed in this mega-structure called ‘global architecture of education.

The next section will discuss Agriculture and why it is viewed as a modern construct.

2.3 Agriculture as a “modern” construct

Agriculture is often perceived as a modern construct and an exogenous practice that was transplanted to Zambia. This conception stems from an understanding that the success of modern agriculture has been attributed to the use of Western epistemology and conventional methods of farming, hence my use of the term conventional agriculture² to refer to modern agriculture. Agricultural development in the West (at least for many years) has been attributed to the use of science and technology which are advanced as driving forces for Western progress and modernity. Furthermore, Western agriculture has been characterised by increased mechanisation and reduction in manual labour, increased agricultural productivity which has made many Western countries food secure and not relying on external food sources, economic growth, and improved income for farmers. This kind of agriculture, contrasted with the Zambian traditional agriculture that is often associated with hard manual labour, low/non productivity, and primitivity, irrational and old fashioned ideas, makes the Western model of agriculture more attractive leading to the death of the indigenous model of farming.

The increased agricultural productivity and efficiency is attributed to the use of inorganic fertilizers, agricultural chemicals, genetically modified organisms (GMOs), new varieties of

² Conventional agriculture: Farming practices that involve the use of chemical fertilizers, pesticides and machinery (Park, 2013, p. 96).

seeds, exotic machinery for cultivating/tilling the soil, planting, harvesting, processing and packaging of agricultural products. This for centuries has rendered agriculture in the West a 'success.' Moreover the pictures of Western agriculture that feature in most of the literature in Zambia have been positive images that portray modern agriculture as prosperity and wealth and mechanisation.

The increased esteem and prestige of modern farming techniques and the craving to acquire the 'newest and best' foreign technology makes Zambian farmers lose confidence in and a sense of illegitimacy of their own knowledge and belief systems. In this age of agricultural development, most rural farmers have been pressured into believing that dominant views of Western scientists, the agricultural chemical sales persons, non-governmental organisations (NGOs) and governmental organisations that support agriculture in one way or another are right. What has probably been under communicated to the Zambian farmer is that "in industrialised countries, agriculture has largely been successful be it in terms of productivity and efficiency, but not necessarily in terms of employment and environmental sustainability" (Warren et al., 1989, p. 103).

This is evidenced in most farmers' affinity to conventional modern agriculture which has led to massive deterioration of land in the Southern Province. The degradation of the environment and low agricultural productivity is a main concern of the Tonga people and is not unique to the Southern province only because in the 21st century, "ecological challenges of the planet have now become mainstream thinking; the pollution of the earth with carbon dioxide emissions has become a serious threat to the climate of the earth" (Bredlid, 2013, p.20). Moreover, Pretty (1991) believes that "the challenge of producing sufficient food to feed a growing world population cannot be met by industrialisation or the green revolution as production is currently above a sustainable level" (p. 132). Zambians are equally concerned about the need to meet the food requirements of the country while at the same time preserve the environment.

Bredlid (2013) observes that "modernisation theoreticians naively argue that since ecological problems are a result of the economic activities of modernisation, then further economic activities should heal the environmental problems" (p.23). Contrary to this, most of the agricultural research specialists in this century note that most of the agricultural development strategies up to now have mainly been based on Western epistemology and technology that have proven inappropriate and therefore suggest that IKs be considered as alternative or

supplementary epistemologies. In line with this, Kincheloe, and some indigenous educators and philosophers suggest the use of Iks to counter Western science's destruction of the earth (Kincheloe & Steinberg, 2008, p. 136-137). Indigenous knowledges can facilitate this 21st century project because of its tendency to focus on relationships of human beings to both one another and to their eco-system (Breidlid, 2013).

This brings the discussion in the next section to indigenous knowledges as a type of knowledge.

2.4 Indigenous Knowledges

While most scholars (Emeagwali, 2003; Sillitoe, 2000; Warren et al., 1989) refer to this concept of indigenous knowledge in singular terms, some scholars like Breidlid (2013) use the plural-“indigenous knowledges”. He argues that there are multiple indigenous knowledges. In other words, Iks are diverse and contextualised; they belong to a certain place. He, however, uses the singular in reference to the Western epistemology because “the focus is on a particular version of that knowledge/epistemology which assumes a hegemonic role globally” (p.2). Sillitoe (2000) refers to IK in singular as “the local peoples’ knowledge, what ordinary folk know.” Sillitoe also attaches geographical and cultural element to IK and contrasts this knowledge with science and notes that;

Though widely shared, than specialised scientific knowledge, no one person or institution or authority encompasses it all. Some coherence may be achieved in cosmologies, rituals and symbolic discourse-which is notoriously difficult to access. It is as much skill as knowledge, its learning across generations is characterised by oral transmission and learning through experience and repetitive practice. It is fluid and constantly changing being subject to ongoing negotiation between people and their environment (p.4).

Some scholars have observed that belief in indigenous knowledge systems being static is changing because most societies with simple agricultural technologies have very complex and enlightened knowledge about their natural resources.

Warren (1991) defines IK in the singular as: local knowledge that is unique to a given culture or society, which forms the basis upon which local decision making in agriculture, healthcare, food preparation, education, natural resources management and a host of other rural community activities are based. Warren's definition though not very different from Sillitoe

has a specific mention of agriculture and like others, views IKs as a basis for local peoples' decision making. I tend to agree with scholars like Breidlid (2013) who views of IKs as multiple knowledges because different groups of indigenous people have their own IKs.

According to Mosimege and Onwu (2004):

Indigenous knowledge is an all inclusive knowledge that covers technologies and practices that have been and are still used by indigenous and local people for existence, survival and adaptation in a variety of environments. Such knowledge is not static but evolves and changes as it develops, influences and is influenced by both internal and external circumstances and interactions with other knowledge systems. Such knowledge covers contents and contexts such as agriculture, architecture, engineering, mathematics, and governance and other social systems and activities, medicinal and plant varieties etc. (p.2)

For Breidlid (2013) "indigenous knowledges are produced in a specified historical and cultural context" (p.31) and are "not generated by a set of pre-specified procedures or rules and are orally passed down from one generation to another" (Semali & Kincheloe, 1999, p. 40). Breidlid specifically contrasts IKs and Western ecological knowledges by their situatedness.

From the definitions given above, the scholars recognise IKs as contextualised knowledges that are experientially and orally acquired by present and preceding generations. Odora Hoppers (2002) questions the clear line that separates the IKs and Western knowledges and proposes some coexistence between the two knowledge systems. In addition to this, Breidlid (2013) argues in line with Hoppers that the 'epistemological silencing' of the non-hegemonic indigenous epistemologies be reversed. This idea is vital when considering the integration of IKs in agricultural science, using a 'westernised hegemonic curriculum' as a tool for integration. Moreover, some scholars argue that, "contrary to what a Western discourse often seems to assume, IKs are often flexible and innovative" (Sillitoe, 2000, p. 4) though "should not be interpreted and categorized within the dimensions of the Western paradigm" (Breidlid, 2013, p. 35).

One other aspect that Breidlid (2013) brings to the definition is the fact that the pertinent difference between the two knowledge systems lies in their worldviews. Vimbai Chivura (2006 as cited in Breidlid 2013, p. 34) notes;

The African worldview declares that our world has two separate aspects: physical and spiritual...the difference between African and European worldviews concerning earth and heaven relate to differences in their attitudes towards the material and the spiritual. Africans regard them as compatible.

In addition the above, Chabal and Daloz (1999, p. 65) state: “a crucial feature of African belief systems are the absence of a firm boundary between the religious and the temporary”. This, therefore, strengthens Breidlid’s argument that a definition of IKs must account for the holistic and metaphysical worldviews of indigenous knowledge systems and their various consequences. Many scholars have linked peoples’ spirituality and their agricultural practices and how (Dei, 2002; Beek, 2000, p. 35; Seur, H., 1992) traditional and new religions in Zambia have influence on people’s acceptance of agricultural innovation. Moreover, lack of separation between the material and the spiritual are not as simple as they appear to the ‘Western eye’ that is used to translate most ideas from a rational base or as Appiah states “which perceives spirituality as symbolism or mythology at best, superstition at the least” (Appiah, K. A., 1992, p. 116). This in my opinion complicates the integration of the two knowledge systems but does not render it unnecessary and impossible.

At the science conference for the twenty first century in Budapest, UNESCO (1999) in its declaration of science and use of scientific knowledge points out that traditional and local knowledge systems are dynamic expressions of perceiving and understanding the world and can make valuable contribution to science and technology, and that there is need to preserve, protect, research and protect this cultural heritage. Warren however argues that the “current mentality behind the transfer of technology and conventional agriculture fosters artificial structures modelled on Western culture” and undermines and displaces indigenous knowledge systems and strips the roots of any experiential creativity in the target area (Warren et al., 1989, p. 13).

Since this thesis is about the integration of indigenous knowledges in agricultural science, the next section will discuss agricultural science and indigenous knowledges and how the farming community in Zambia has tried to integrate this knowledge into soil tillage systems that are meant to conserve the soil.

2.4.1 Agricultural Science and Indigenous Knowledges

While science is still the dominant paradigm when it comes to issues dealing with the environment, the science community is equally beginning to raise questions about the validity

of scientific environmental knowledge as a sole basis for knowledge and are suggesting that it is important to recognise the role that indigenous knowledges play (Kulnieks et al., 2013).

Understanding indigenous knowledges and perceptions can point to some ideas and practices that are necessary for living but are often overlooked by formal science, and can help in understanding the farmer's perspective (Warren, 1991, p.26).

Agriculture in Zambia has been associated with development and improvement of life for the rural communities. It is becoming evident all over the agricultural world that intensive farming systems that require high inputs of chemical fertilisers, chemical pesticides, hybrid seeds and extensive mechanised irrigation are not only financially taxing on the farmer but also are also causing soil degradation. But if modern development is to succeed, it "needs to match the adaptability of its indigenous equivalent." However, it does not mean indigenous strategies be simply adopted but that the conservation and sustainable principles inherent in the nature of indigenous agriculture be recognised and encouraged (Warren, 1991, p. 28). Some scholars argue that "local practices can be links for developing ways of increasing productivity and sustainability of local resources and may reveal missing ecological information which can help scientists develop alternative agricultural technologies less dependent on non-renewable resources and environmentally damaging inputs (inorganic fertilizers and chemical pesticides) than conventional technologies (Odhiambo, 1990, as cited in Warren, 1991, p.29).

The knowledge, skills and survival techniques of farmers operating with low levels of modern agricultural inputs has usually been ignored or overtaken by the promotion of Western technological inputs. For example when it comes to tillage³ practices, farmers in industrialised countries have established various tillage practices like: Disking, sub-soiling, harrowing, field cultivating, hoeing, and row-crop cultivating, which necessitates heavy equipment (Warren, 1991). This equipment has been transported to the South in the hope that the efficiency with which they have been operated with in their Western environment will apply to the recipient country. On the contrary, they often cause various negative influences on soils like the soils in the Southern Province where this field work was conducted. This is evidenced in the research findings in Chapter 4. The majority of small scale farmers in developing countries like Zambia use low- cost, locally adapted technologies for tillage, for example; ploughing using oxen, burning residues, ridging up with a hoe, hoe minimum

³ Tillage is the mechanical operation of preparing soil to make it more favourable for plant growth.

tillage, and overall digging with a hoe. All these are labour intensive practices that farmers have worked with for hundreds of years.

Hagblade and Tembo (2003) in their study of Zambian conservation farming define conservation farming as a “number of tillage practices that in combination conserve soil, moisture, fertiliser, seeds energy, time and money” (p. 13). The two researchers further discuss that conservation tillage methods have not been popular among farmers in Zambia even with direct encouragement from the change agents to involve the local farmers as will later be discussed in the chapter.

Ironically, while most of the agriculturalists in the West are studying conventional tillage mechanisms through the new perspective of sustainable approaches to agriculture, meanwhile the governments of developing countries like Zambia continue adopting policies that rely on highly mechanised tillage systems developed in the West (Warren et al., 1991). While this is so, it is important to note that in this modern era, it is difficult to find agricultural practices that do not require modern production technologies.

Sustainable agriculture on the other hand places emphasis on improvement and preservation of land while increasing its productivity and decreasing dependency on external inputs. Sustainable agriculture is as an “agricultural system that is ecologically viable, and socially just, it uses techniques to grow crops and raise livestock that conserve soil and water, use organic fertilizers, practice biological control of pests and minimise the use of non-renewable fossil fuel energy” (Park, 2013, p. 422). Even though some Zambian agricultural researchers have recommend conservation tillage, which reduces frequency and intensity of tillage in order to ensure sustainable agriculture, adoption of minimum tillage⁴ by farmers in Zambia has been slow and unpopular in spite of intensive educational efforts put in by agricultural extension officers and other agricultural change agencies because of the intensive labour required to carry out the operation. However, in countries with highly developed agricultural technologies, pressure to increase economic efficiency has resulted in widespread acceptance of reduced tillage. For example in the United States (U.S.A.) and United Kingdom (U.K), minimum tillage seems relevant to both the commercial producer and the small scale farmer (Warren, Rajaram, G., Erbach, D.C., 1991; Shenk & Locatelli, 1980). Some scholars like

⁴ Minimum tillage is “an approach to the conservation of soil and water resources in which the crop residue or stubble is left on the surface rather than ploughed under, in order to minimise the number of times that filled is tilled” (Park, 2013, p. 271).

Sillitoe (2000) have attributed the rejection and failure of some agricultural innovations in the local communities to lack of consideration for the local contexts and IKs of the local population. This is because many farming systems are based on the farmers' intimate knowledge of soils, vegetation, climate, seed types and pests, developed over many years of experience which have become part of the farming traditions.

Since this thesis is about the integration of indigenous knowledges in the teaching of agricultural science in the schools, the next section will discuss the global architecture of education.

2.5 Global architecture of education

In my introductory chapter, I point out the urgent need to start 'new conversations' as proposed by Breidlid (2013). I agree with the view of seeing the school as a natural starting point for these conversations not only because of the large catchment area but also that school is where a large population of the future generations that could save the environment through sustainable agricultural practices is found. Moreover, "schools and educational institutions are important sites where knowledge production takes place" (Breidlid, 2013, p.54).

However, national education systems are becoming more and more assimilated into a structure called the 'global architecture of education', which Jones (2007) defines as: "a complex web of ideas, networks of influence, policy frameworks and practices, financial arrangements and organisational structures - a system of power relations that determine how education is constructed in the world" (p.325). It is a "common epistemological discourse which dominates most educational systems in the South and North with the exception of the Islamic and socialist systems" (Breidlid, 2013, p. 2). From the above definitions the architecture stands out as a superior force which at the moment dominates the education discourse. More so for countries like Zambia that so much depend on donor aid as politicians negotiate educational policies. This phenomenon is not unproblematic.

Since this thesis as earlier pointed out is about the integration of indigenous knowledges in the teaching of agricultural science, keeping in mind the soil and environmental crisis, I wish to discuss in this section how the global architecture is related to the integration of IKs. I am aware that the global architecture of education is a grand and complex idea but I find this concept suitable as an analytical tool for my research because of the structure of the

education systems in the global South of which Zambia belongs. Zambia has a curriculum whose components and pedagogical principles developed in the context of the modern industrialised society (Westernised/Eurocentric curriculum). Large components of this curriculum of the 'ideal' education are not only impractical but counterproductive and deemed alien by recipients (Serpell, 2010). Breidlid (2009) calls this a modernist curriculum and strongly argues that "its failure to acknowledge indigenous knowledges elevates it above other world views"(p.144)while its "prescriptions are not helping the African children" (Abdi & Cleghorn, 2005, p. 17). I will discuss these ideas further in the analysis chapter coupled with document analysis of the Zambian agricultural syllabus.

Many scholars, for example Breidlid (2013), advance various reasons why this Westernised curriculum is somehow dysfunctional as it sidelines the IKs. One of the issues Warren et al., (1989) points out towards the dysfunctional aspect of this curriculum is the issue of medium of instruction in the teaching of agricultural science;

The separation of modern agricultural science and technology from indigenous traditions is reinforced in African schools, not only by practice of excluding traditional knowledge from instruction but also by the use of foreign languages to teach the subject (p.63).

Scholars like Brock-Utne (2000) argue for the importance of instructing learners in their mother tongue. Some learners refer to the use of English in the teaching and learning of Agricultural Science in Zambia as a challenge to their understanding the content. Consequently, theories and practices of education have their origins in the West and then transported to other parts of the world like Zambia. This includes teaching methods, text books and the curriculum content. In agriculture, it is also the transfer of technology in all its various forms (Sillitoe, 2000) as already discussed. Tucker (1999) questions and critiques the efficiency of this transfer and argues that the West cannot be replicated in the South, because despite the transfer of technology, infrastructure and other gadgets, "the symbolic engine is missing" (p.1). Western agriculture cannot simply be transported in totality to the South. The implication being that the cultural context within which the transfers are carried out is not considered. In line with this, Breidlid (2013) suggests the "need for communication between various knowledge systems" (p.35). This will be further discussed in the analysis chapter.

Agricultural education is supposed to change the way the learners think about solving agricultural problems but not alienate them from their daily lives. Furthermore, this education

is meant to influence how events of everyday life are given meaning and explained and how a farmer would react when faced with challenges. While it is stated that school lessons in modern agriculture are further designed to build capacity for ‘knowledge based productive behaviour’ (Warren et al., 1989), this grounding can only take place if there is an evident and practical connection between the learners’ daily life (home) and the school. In line with this, Breidlid (2013) argues that the “epistemological transfer in itself alienates students from their home environments by introducing them to alien culture and epistemology” (p.55).

The purpose of teaching Agricultural science in schools is to connect agriculture to knowledge of modern science, in so doing, modernise agriculture. In this case, indigenous crops, livestock, poultry breeds, equipment used for production and pattern of land are acknowledged as starting points for agricultural modernisation but the cognitive and communal premises of indigenous knowledge production systems are almost totally ignored (Warren et al., 1989). Many scholars in the contemporary world (Kulnieks et al., 2013, Breidlid, 2013; Emeagwali, 2003; Sillitoe, 2000; Ogunniyi et al., 1995) now are contending the relevance of an education that does not consider the context and there is a “growing recognition that huge ecological knowledges are stored in indigenous communities globally, and that IKs, biodiversity and sustainable development are linked” (Breidlid, 2013, p. 38).

Considering teaching methods in agriculture, African belief systems include myths, cosmology and rituals as highly symbolised information sources about agriculture and the relationships between ‘peoples’ and their environment. The wisdom embedded in the rituals, myths, songs, folk stories, and proverbs have many functions and sometimes can be used to reinforce traditional social values to conserve the environment upon whom the whole community depends. This places responsibility on every person. Myths are taught through story telling which the theorised method of teaching agricultural science does not take into consideration. Of course teachers point out the pressure to teach what the syllabus prescribes and the need to cover the examination materials. It is my contention and hypothesis that if the learners in the Zambian schools could learn some of that traditional wisdom, they will connect well with the environment and learn to serve it. This is in line with Breidlid (2013) when he noted that “carriers of IKs like elders, chiefs or mythical figures who are often rubbished by people from the North, may be carriers of sound ecological practices” (Breidlid, 2013, p.39).

In relation to the inclusion of IKs in agriculture curriculum, Kulnieks et al., (2013) observes that where IKs inclusion has not been actively developed in school, learners are continuously being immersed in European educational values and world views. This Euro-traditional focus is very strong and rarely identified as problematic while is responsible for the maintenance of the superiority of the world view and value assumptions underlying the school's curriculum. "Nature and land are central concepts in indigenous knowledges as these are related to spirituality and the supernatural" (Breidlid, 2013, p.37), yet the Zambian curriculum leaves out this worldview in the teaching of agricultural science which is very much a land oriented subject. Furthermore, there is actually no 'single' European science agenda and in many European schools, the teaching of nature is actually quite heavily localised. In the same breath, Kulnieks et al., (2013) argue for teachers' need to "promote and provide opportunities for learners to ask questions about differences between their own traditions and relying upon Western ways of thinking and uses of technology" (p.229). Moreover, in the light of what has been said above, the Zambian education policy ("Educating Our Future," 1996, p.35) among its goals aspires to produce a pupil who is capable of; appreciating the relationship between Zambia's ethnic cultures and customs and traditions.

The next chapter discusses the methodology that was employed in the data collection process. It discusses the way I approached my research objectives and research questions and how I used the research instruments and why.

3 Methods

This chapter presents an overview and outline of the research methodologies that I employed in exploring the integration of indigenous knowledges (IKs) in the teaching of agricultural science in selected secondary schools in the southern province of Zambia.

The chapter further gives detailed explanations on the research methods used and steps taken to collect the desired data and why I used those methods. Furthermore, issues about the research sites, sampling procedures, research instruments, data collection procedures are addressed. The chapter later also discusses issues of reflexivity, validity and reliability, ethical concerns and concludes with the limitations of the study. The first section to this chapter discusses the rationale for choosing the qualitative research strategy.

3.1 Research design

This study adopts the qualitative research design because of its value and emphasis on the exploration of richness, depth and complexity of phenomena, a “strategy that usually emphasises words rather than quantification in the collection and analysis of data” (Bryman , 2008, p. 366). Furthermore, “description provides a skeletal frame for analysis that leads to interpretation. An interesting and sufficiently described report allows the reader to understand the basis for an interpretation which allows the reader to appreciate the description”(Patton, 2002, p. 503). The qualitative research’s exploratory study is premised on a socio-cultural constructivist epistemology where learning as a socio-cultural activity involves learners and teachers playing specific roles in negotiating meanings from mutual interaction. Moreover, the qualitative choice was deemed appropriate to this research because of its interactive nature, and its “focus on the cultural everyday situated aspects of human thinking, learning, knowing, acting and way of understanding ourselves as persons as opposed to the “technified” approaches to the study of human life (Kvale, 2009, p. 12). In other words, this strategy allows me to ask the “who” and “why” questions in order to get deeper meanings of certain issues. As I got stories of the respondents, I would be able to see the world with their eyes and put a face on the needs seen by the community.

The area of indigenous knowledges in agricultural science is one of the least researched areas in Zambia. Therefore given the exploratory nature of the topic and my own desire and interest in hearing and getting an insight into the respondents’ perspectives the qualitative approach

was appropriate. This is echoed by Bryman (2008), when he states that for “topics on which no or virtually no research has been done in the past, the quantitative strategy may be difficult to employ because there is no/little prior literature from which to draw leads” (p.26).

Moreover, Corbin and Strauss (1990) assert this by stating that the “qualitative strategy would help in detecting and understanding what lies behind a phenomena about which little is known” (p.20). Therefore, through conversation, interpretation and negotiation of questions and responses between the researcher and the respondents, insight into one another’s world is gained and hopefully useful knowledge is established.

Having discussed the research design, the next section will discuss the research sites.

3.2 Research Sites

The research was conducted in a village, the schools, the agricultural institute and the curriculum development centre. My choice of research sites was dependent on the need and ability to access the research sites that were relevant to my field of study and also an “appropriate population of potential subjects” (Berg, 2001, p. 29). However, having said that, I was aware that I was researching on a topic that was not familiar to the Zambian educational research – the integration of indigenous knowledges in the teaching of agricultural science. I needed to hear various voices; in the village among ordinary farmers, the agricultural institute, the school and in government about their perceptions on the phenomenon at hand.

Though the research basically took place in the southern province of Zambia, to get a representative voice of the views on the topic, the research sites were located far apart in different parts of the province which meant sometimes travelling long distances from home.

Three schools were in the study, two single sex boarding schools in the rural area and one co-education public school in the city of Livingstone. This was to establish whether the rural or city aspect of the school location would have some bearing on how learners perceive and respond to the issues of indigenous knowledges in agricultural science. The gender aspect was to establish how boys and girls when learning together or when each sex is on their own relate to issues of agriculture and indigenous knowledges.

Having been a teacher for eighteen years and working in the ministry of education, gaining access to these sites was not a big challenge. I was able to arrange appointments through phone calls and text messages. The challenges experienced in relation to selection of sites will be discussed later in the limitation to the study. I will use cover names for my respondents in order to protect their privacy, therefore I will refer to them in terms of their profession or position, except the village elder and his wife's names are real because I obtained permission from them. Otherwise to give my imaginary audience a sense of where the research sites were located, each research site will be discussed briefly.

3.2.1 Research Site A

Simoonga village is in the Southern province of Zambia in a rural place called Chikuni which is about 218.5 Km from the city of Lusaka and 11Km east of the town of Monze which is the nearest town. Village headman/elder Dominic Mooya (83 yrs) and his wife Anna (76 yrs) live there.

This is one of the villages surrounding what is called Chikuni mission which was the first Jesuit missions in Zambia established in 1905 long before Zambia became independent from her colonial rule. Since the beginning of this mission, there was a constant drive to help the local (Tonga) farmers to develop themselves in all endeavours of life and especially in agriculture.

Having lived here for 60 years, he has vast pieces of land surrounding his homestead and from my discussion with him, it was easy to establish that livelihood in that village depended on that land. Being one of the earliest villages established in that farming area, and being a Tonga person, steeped in tradition and tribal beliefs, I wanted to hear how much the "white" man's knowledge/conventional farming methods were influencing the farming activities and establish whether indigenous knowledge was still a value among the Tonga people.

Most pupils that attend the two big secondary schools in Chikuni come from the local population, therefore hearing village elder speaking was representative of hearing the local farmers and parents talking, giving a background from which the learner in the rural school is coming from. Having said this, I am aware that the town/city parent might not be represented but they would be heard in their children.

3.2.2 *Research Site B*

The second research site was Kasisi Agricultural Training Centre. This is non profit making institute located 30 Km north-east of Zambia's largest capital city Lusaka. It was established in 1974 which is ten years after Zambia's independence.

It initially offered two year course in conventional/industrialised agriculture but from the mid-1980s went into organic sustainable agriculture. It has now moved into short courses of three to five days and two weeks in organic agriculture including residential on farm courses, village based training (extension services) and study circles. They handle approximately one thousand two hundred farmers per year.

One of the central tasks of this institute is to develop local strategies to conserve environmental resources and providing lifelong education in sustainable farming. They teach farming techniques that do not require chemical pesticide or fertilizer applications and that require reduced water inputs. They offer broad knowledge in basic challenges of subsistence agriculture for example bee keeping, vegetable and cotton production, biological pest management and agro-forestry. They also teach and invest in "appropriate technology" where they research and develop equipment and tools that are affordable for use in rural areas.

Basically the institute promotes indigenous methods of farming. Apart from their view of indigenous knowledges I wanted to hear how some of their indigenous methods and activities could relate to the secondary school classroom agriculture lessons because this institute is one of a kind in the whole country.

3.2.3 *Research Site C*

The third research site was the curriculum development centre (CDC) which is one of the directorates at the Ministry of Education, Science, Vocational Training and Early childhood education. It is a government body where they formulate, revise the curriculum and give directives for its implementation. Each subject area has its own subject specialists who are responsible for designing the curriculum and syllabus for it. Zambia has a centrally designed curriculum, therefore the inclusion and future of IKs in educations hinges on the policy makers.

3.2.4 *Research site D*

The fourth research site was a boy's boarding school of 720 pupils in the rural area located 218Km from the city of Lusaka and 10Km east of the town of Monze. This is an old grant-aided school established in 1949 by the Jesuit fathers.

The school is one of the most sought for school in the country because it has a long history of high grades in the national examinations. While most of the schools in Zambia are strategically located so that the children in a particular locality can attend, for example rural schools are meant to attract most of the rural population in a particular catchment area. It seems the geographical location of this school does not influence who goes there. The majority of pupils at that school are of mixed origins, though half of its population is local. The school is quiet urbanised, by Zambian standards with elements of modern technology and beautiful infrastructure-buildings, football and basketball grounds and entertainment halls, however still rural because of its proximity and interactions with the local community.

In the midst of all that, the school promotes core values of forming the conscience of the pupils in the quest of dignity of a human person and so that they will have preferential option for the poor, the under developed and those on the margins of society. They are taught about care for the planet.

It could then be assumed that the socialisation, mindset and attitudes of pupils in that school would not just be influenced by home but also the school environment and culture of the surrounding community.

3.2.5 *Research site E*

The fifth research site was another single sex boarding secondary school of seven hundred and twenty girls located 69Km from the nearest town of Mazabuka. The school is strategically situated in the rural area to encourage the education of rural girls. Having said this, the school has a percentage of girls coming from other parts of the country outside the province.

However, while a lot of urbanisation has affected and influences most schools in the cities and urban areas, this school deliberately remains traditional. Apart from the fact that parents support most school projects, pupils grow some of their own food. The school has a school

garden and fields; they rear pigs and have some herds of cattle which supplement their food requirements.

The open location and isolation of the school from the city allows for frequent interaction between pupils and the community. For instance, the school girls are encouraged to do some community service during the weekends. Moreover, the community around is relatively traditional and the interaction it has with the pupils through projects and traditional festivities make the pupils more aware of the traditions of the people compared to those in the city.

3.2.6 *Research site F*

The sixth research site was a co-education (boys and girls) day secondary school of 2100 pupils located in the provincial capital city Livingstone. Being a tourist capital and boarder town, Livingstone is densely populated and is a melting pot of many languages and cultures like any other metropolitan city. The social aspect of the city is also influenced by cross boarder trading. This is evidenced in the number of languages one encounters in the town.

This makes a very mixed population of pupils in the school compared to the other two rural boarding schools in the study, where the higher population of pupils is from the local catchment area. This diversity may affect the city pupils, and the fact that they have to walk from school to home and vice-versa everyday gives them contact with the culture in their home environment which they would not have, had they been in boarding. This everyday contact with their home environment and culture compounded with influences of the tourist activities in the town probably influences their attitudes, mindset and value systems.

The next section will therefore look at my target population and why that particular population.

3.3 Target population

The southern province for many years was Zambia's 'bread basket' and it is the land of the Tonga people who are mainly farmers. At the moment, the Tonga people are still farmers, yet the southern province is no longer Zambia's 'bread basket' because most of the land is degraded due to deforestation (Haggblade & Tembo, 2003, p. 10).

The target population, being the “universe of units from which the sample is selected” (Bryman, 2008, p. 168) had to be relevant to my research questions and aims. The two single sex boarding schools were in the rural setting while the co-education day school was in the city. However, the differences in social influences/background and sex to some extent presented an area that could bring variation in their responses to the research phenomenon of the integration of indigenous knowledges in agricultural science teaching and learning. Moreover, agriculture in the Zambian tradition seems to be stereotypically a male endeavour, so the sex component becomes essential.

I needed to hear the voices of the learners because they provide the ground upon which the agricultural science syllabus is implemented. Furthermore, they form a generation which later will pass on the indigenous knowledges to ensure its continuity.

The voices of the teachers and their views were cardinal by virtue of their being implementers and movers of the curriculum; they are in touch with the learners in the classroom and therefore have first hand information on what goes on in the classroom.

The village elder/headman and the agricultural extension officer were not only representative of the voice of the local farming community but also the home environment where the learner was coming from as this has influence on the learners attitude and mindset.

The curriculum specialists’ views were important in that they are the formulators of the curriculum, they are the authority behind the curriculum, and how they view indigenous knowledges has a bearing on its inclusion in the syllabus and its implementation. Therefore, the four groups of respondents and the four categorical environments made my target population.

The next section looks at the study sample.

3.4 Study sample

Having chosen the qualitative method, which places a lot of “emphasis on words other than quantities” (Bryman, 2008, p. 22) and with its concern of seeing the world in the respondents perspective, I had to be prudent in the number of respondents to be employed as a sample. Considering time and resources available, compounded with geographical distances between researches sites, a relatively small number of respondents had to be engaged.

Agricultural science is one of the subjects with the least number of qualified teachers because most of them who are qualified go into other jobs. Moreover, not all schools in the country offer the subject because one of the conditions is that a school should have some land in order to offer the subject. However, that seems not to be the only reason, the other being that there is stigma attached to the subject that it is not a hard science. The three (3) schools in the study had a total of five teachers, two teachers in the girls' boarding school, two teachers in the public school and only one teacher in the boys' boarding school. All the five (5) teachers were interviewed. Six pupils were interviewed from each of the boarding schools in the study sample giving a total of eighteen (18) pupils.

In addition, one (1) village elder, one agricultural extension officer and three science curriculum specialists among which one of them was a woman were also included in the sample. This resulted in a total number of twenty eight (28) research participants, these, being people with particular knowledge about the discussion whose insights could prove valuable in helping the researcher understand a particular situation (Patton, 2002). The total numbers of respondents by sex is illustrated in the table below and the inclusion of the female voice is to give a voice to women on a subject that is not gender based to keep a balance of ideas, in an environment where the man's voice usually dominates.

Table 1 Distribution of respondents by sex

Respondent	Male	Female	Total
Subject specialists	02	01	03
Village elder	01	-	01
Subject teachers	04	01	05
Research site D pupils	06	-	06
Research site E pupil	-	06	06

Research site F pupils	03	03	06
AEO	01	-	01
Total	17	11	28

3.5 Sampling procedures

Sampling is defined as a way of obtaining a group of people or objects to study in that area, representative of a larger population or universe of interest (Stacks, 1999). Purposeful sampling or what is sometimes termed judgemental sampling became the choice for this study as opposed to random sampling⁵, because it aims at selecting “participants in a strategic way so that those selected would be relevant to the research questions” (Bryman, 2008, p.415; Patton, 2002).

Agricultural science not being a compulsory subject offered in all schools in the province meant that only pupils and teachers from schools offering the subject could participate in the study. In addition, only classes where the subject was being taken could participate.

3.5.1 Sampling of schools

While southern province has a number of secondary schools both in the rural and urban areas, offering agricultural science, I would not be able to access all schools. Therefore from the onset, I wanted to involve single sex, co education, rural and urban secondary schools. It is important to note that most rural secondary schools are boarding while most of the city schools are day schools.

Therefore, to rule out the “human bias”(Bryman, 2008 p.172) so that schools were not selected on subjective criteria such as records of achievement or attractive and orderly surroundings, the purposefully sampled single sex schools’ names were written on a piece of paper and two people were asked to draw a paper each. At first both drew out girls single sex

⁵ Random Sampling: also known as probability sampling. It is a sampling technique which involves the selection of a group of people for study from a larger population where each individual is selected by chance and each has a known probability of being included in the sample(Bryman, 2008).

schools and so the papers were put back and another draw made. Then the two single sex schools, one for boys and the other for the girls were drawn. Then the names of all the city/urban day schools were written on a piece of paper and the process was repeated and one paper was drawn for the third school in the study. It is also important to note that all schools in the sample implement a national/centralised agricultural science syllabus provided by the ministry of education.

3.5.2 Sampling of learners

Purposeful sampling was used to select learners to take part in the study. It is important to note here that not only does the Zambian education system like others in sub Saharan Africa have a centralised curriculum but also the medium of instruction is English (Brock-Utne, 2000) and most of the learners struggle with the language.

The topic on the integration of IKs into agricultural science is not a well researched area in the Zambian academia, therefore information is scarce. I therefore needed a sample of students who had the ability to articulate their own experiences and aspirations with regards to indigenous knowledges. Snowball sampling⁶ was therefore employed at each of the schools under study, I requested the teacher to provide the names of learners with those attributes and who would be willing to take part in the study.

3.5.3 Sampling of teachers

There were very few teachers available and so purposeful sampling/total population sampling was employed. Moreover, teachers selected were all Zambians who had been in contact with scientific and world views of the Zambian people through their interaction with the community and science lessons they received through their own years of schooling and teacher training. Being Zambian, they probably would have been exposed to similar socio-economic conditions and families with traditional practices found now.

Teachers were important to the study not only as implementers of the syllabus but as people whose daily interaction with the learners has significant influence and a bearing on the learners' perception of their environment and formation of concepts

⁶ Snowball or chain sampling identifies cases of interest from people who know what cases are information-rich, that is good examples for study or good interview subjects (Patton, 2002).

3.5.4 Sampling of the village headman, the AEO and the curriculum specialists

Expert sampling was employed in the selection of agricultural extension officer and curriculum specialist, with a specific interest in their knowledge and experience with organic farming respectively. The choice of village headman was a mix of methods: snowball sampling, through personal networks and recommendations from informed connections and convenience sampling in terms of location and accessibility. The village elder's village was not far from one of the convents where I could easily get accommodation. This was to make it easy for me to cut back on time and resources, as already indicated in the opening section that my research sites were far apart.

The next section discusses the research instruments employed to enable me collect data that would answer my research questions.

3.6 Research instruments

With regards to the collection of data and to enable me to gather as much information as possible, I employed three methods of data collection because, the “use of more than one data collection method, results in greater confidence in the findings” (Webb, et al, (1996) in Bryman 2008 p. 379). This is called triangulation, based on the premise that; “no single method ever adequately solves the problem of rival causal factors, because each method reveals different aspects of empirical reality, therefore, multiple methods of observations must be employed” (Denzin 1978, p. 28 as cited in Patton, 2002, p. 247).

Basically I used semi-structured interviews, non participant observation and document analysis. Triangulation here meant a combination of the above methods and it strengthens the study (Patton, 2002). As a researcher, I used my extensive experience as a teacher of agricultural science to understand aspects of the phenomenal world by selecting important aspects to be incorporated in the data, I analysed the data to come up with the themes and at the end a coherent script (Barrett, 2007, p. 418). The three data collection methods used in this research will be discussed below.

3.6.1 Semi-structured interviews

This method of data collection was extensively used in comparison to the others. Most of the information in this research was collected using this method because of its “interactive nature

and attempt to understand themes of the lived everyday world from the respondent's own perspective" (Kvale, 2009, p. 27). In other words, the richness of this method lies in its pursuance of seeking descriptions of the interviewee's world with respect to interpretation of the meaning of the topic under study.

Through my interactions with the various categories of respondents around the topic of the integration of indigenous knowledges in teaching, in their actions, responses, pauses and words and meanings they conveyed, they helped me in the construction of social reality and gave me an insight into their understanding and view of indigenous knowledges. As Kvale and Brinkmann (2009) discuss that with interviews, knowledge is generated as two or more people exchange views on a topic of mutual interest. That does not imply that the interactions are exhaustive in their representation of the issues at hand but by virtue of it being a semi-structured interview, that it is somehow flexible and would allow the respondents to explore aspects they found relevant and helpful. It allowed me to probe and seek clarification when appropriate; it allowed the rephrasing of the interview questions and making follow up questions to seek further clarity. Therefore, the challenge of analysing data from a semi structured interview, that I found was not so much into what and how much they said but more into how and why they responded the way they did. This can be difficult to capture when reading a book or a text but is possible through an interaction as McCracken (1988) postulates;

The purpose of qualitative interview is not to discover how many, and what kinds of people share some characteristic but rather it is to gain access to the cultural categories and assumptions according to which one culture construes the world. How many and what kinds of people hold these categories and assumptions is not.....but rather qualitative research does not survey terrain but mines it (p. 17).

One of the factors I had to take into consideration was that of language and having a practical experience of what was being discussed. The interview with the village headman and the agricultural extension officer lasted approximately 120 minutes each, because the interview with the village headman was conducted in Tonga which for me was my third language. In this interview, there was a lot of shuffling to and fro in my mind, but as Berger and Luckmann, (1991) state that "understanding of language is essential for any understanding of reality of everyday life" (p. 52). This therefore meant I had to interview the village elder in the language he understood and spoke fluently.

The interview in the farming institute was firstly conducted in the office, after which the extension officer gave me a guided tour of the farm to see the various applications of integrating indigenous knowledges in farming methods. This helped me to verify what he was talking about. All the interviews in the various schools were conducted at the science laboratory where a notice was put on the door “interviews in progress, do not disturb”. Most of these lasted between 20- 50 minutes. The curriculum specialists were interviewed in their respective offices.

All in all, a total of 28 interviews conducted with the help of different interview guides appropriate to the group (see appendix I- V) which I kept reviewing as the interview progressed and depending on what was being said, in order to seek clarity for myself and the respondents. Patton (2002) asserts this as he states that an interview guide “provides subject areas within which the interviewer is free to explore, probe and ask questions that will clarify and illuminate the subject under study”(p. 343). The interview guide further helped me to be systematic and comprehensive by stating clearly the issues to be explored, in so doing use the available time in the interview profitably (Patton, 2002). Diary notes were taken with the consent of the respondents and all the interview sessions were recorded using a voice recorder on my phone.

The next section discusses another data collection method called non-participant observation.

3.6.2 Non-participant observation

This is a method of data collection which according to Bryman (2008) involves the observer going into the research environment and observes but “does not participate in what is going on in the social setting.” Moreover, it involves unstructured observations where an observation is not used for recording of behaviour but aims at recording as much detail as possible, the behaviour of the participants with the aim of developing a narrative account of that behaviour (p. 257).

While Yin, (1994) points out that observations can be time consuming, and activities under observation may turn out differently because participants become self conscious that they are being observed, their importance cannot be overstressed. The choice of non participant observation enabled me to observe the teachers in their teaching process and saw how the

learners were responding to the content that was being delivered. I was more interested in the teacher's methods of delivering the content in relation to how they integrated indigenous knowledge and the visible effect it was having on the learners.

I spent three days at each of the schools under study. I observed two lessons on different days in one rural and one city school, but was only able to observe one lesson in the boys' rural school. Within that period, the ability to immerse myself in the setting as a non participant observer, allowed me to devote more time to the observations. I paid particular attention and focus on the examples that were being given in class, the words, gestures and looking out for any indigenous methodologies in the teaching for example songs, story-telling, riddles, or seeing an innovative idea of engaging or inviting a local elder or community member to give some input on some topic of discussion. I was able to have an overall idea of the attitudes of both teachers and learners, as well as the challenges they face in teaching and learning of the indigenous knowledges dimension of agricultural science. Observation was a way of verifying information collected during the interviews.

3.6.3 Document analysis

This is “an approach to the analysis of documents and texts that seeks to quantify content in terms of predetermined categories and in a systematic and replicable manner”(Bryman, 2008, p. 275). Policy documents, namely; the curriculum and the agricultural science syllabus were reviewed with a special focus on seeing how indigenous knowledges are being presented and integrated into the syllabus in terms of, content, teaching objectives and reference to local projects. I wanted to find out how much practical was being used in the teaching of the subject as opposed to the theoretical approach, which I looked for by use of teaching methods, as well as the content with reference to learners' use of manipulative skills and local projects. Altheide (1996 in Bryman, 2008, p. 276) refers to this as ethnographic or qualitative content analysis where emphasis is on the role of the investigator in the construction of meaning of the text. It is ethnographic because emphasis is on the allowing of categories to emerge out of the data.

3.7 Data collection procedure

The month of July and August was time for school mock examinations and holidays, so the schools were not very accessible at that time. This gave me time to do my interviews with the

village elder, the curriculum specialists and the agricultural extension officer between. The interviews that required school were done in September and the first week of October, though again caution with time had to be taken because it was time for the final national examinations in the schools.

Each interview, except for the learners was preceded by getting information on the respondent's professional qualification and years of teaching experience for the teachers and years of practice for the extension officer and the curriculum specialists. This was meant to be an ice breaker so as to build rapport and trust with the respondents, making it easier to access information that would otherwise not be possible if another data collection method was used (Gall, 1996). The village headman was engaged by first talking about his age, wife and children, just taking general interest in what was happening in the village and answering his curious questions about the researcher. As for the pupils asking them about how they were finding school and what grade they were in and letting them know what the researcher was doing created rapport.

An interview guide directed the respondents to frame their answers around "instances of action to better illustrate their inclination towards indigenous knowledges or western knowledge" (Mpfungu et al, 2011, p. 94) in their teaching and learning or as they map out educational policy in the case of the curriculum specialist.

This was followed by a transcription of the interviews. From the twenty seven (28) interviews, only twenty (20) were transcribed and the seven un-transcribed interviews came out of the pupils' number. This was because I reached a data saturation point, where there was repetition and no new information was ensuing from the conversations (Patton, 2002). Analytic notes and comments were taken throughout the interview sessions to help in the identification of themes from the data and issues that needed further clarity at a later stage.

The transcription was done using open coding in order to "break down, examine, compare, conceptualise and categorise data" (Strauss & Corbin, 1998, p. 61). This was to create tentative labels for groups of data that was summarising the respondents statements (Creswell, 2007). Colour and letter codes were used to come up with categories. Three groupings basically emerged from the participants words; western knowledge, indigenous knowledges and agriculture. A thorough reading of the open codes was done and further condensation of data was done. A matrix was developed to envision/conceptualise the various

themes that unfolded from the data and identifying the connectivity which would help in merging themes (Creswell, 2007) was done.

The agricultural science syllabus and curriculum were analysed and details will be discussed further in the analysis of findings chapter. The next section looks at data analysis.

3.8 Data analysis

There was a constant reading and re-reading of the bulk of data that was collected on the integration of IKS in agriculture. This activity had a twofold purpose in that not only did it enable me to familiarise myself with the data and think of possible ways of analysing it; but it was also a way of organising the collected data into patterns and categories while looking for relationships and linkages among descriptive dimensions (Patton, 2002).

Grounded theory was used as an analysis tool because “it offers as a framework, a set of coding procedures to help provide some standardization and rigor to the analytical process. It builds theory rather than test theory and emphasise being systematic and creative”(Strauss & Corbin, 1998, p. 13). The process of data analysis involved categorising, describing, condensation and interpreting meaning of the categorised data to arrive at categorical conclusions (Tesch, 1990; Kvale, 2009). This finally led to the organisation of data according to the emerging themes and concepts as deemed relevant to the research questions.

3.9 Reflexivity

I tend to agree with Huberman and Miles (2002, p. 8) when they say that:

Researchers have their own understandings, their own convictions, their own conceptual orientations; they too are members of a particular culture at a particular historical moment. Also they will be undeniably affected by what they hear and observe in the field, often in unnoticed ways (p.8)

Having chosen the qualitative approach, with its interactive nature and a research topic that had so much not been researched in Zambia, made me undeniably aware of my biases. I was aware of how much the interaction and the lectures in the Masters class of multicultural and international education (2012-2014) and the issue of indigenous knowledges in the previous year had impacted on me. It gave me a complete different perspective with regards to indigenous knowledges. I became aware of the environmental crisis threatening the face of

the earth and was hearing environmental degradation with “new ears”. Having gone through a Eurocentric education system and being a teacher of agricultural science, it was hard to totally ignore the influence that it had on my objectivity and interactions with the respondents and the interpretation of data. This made me an insider and therefore, the respondents’ responses were most likely influenced by these factors. Patton (2002, p. 65) calls on researchers to be reflexive, thus to “engage oneself in an ongoing examination of what I know and how I know it, and ownership of one’s perspective and voice as well as voices of those one interviews and reports to.” Furthermore, I was conscious of my struggle and the fact that as a researcher, I was not supposed to have a ‘louder voice’ and take the stance of one going out to “save the world.” Bryman (2008, p. 682) states that “such knowledge from a reflexive position is always a reflection of the researcher’s location in time and space.” This helped me to keep my personal feelings and perspectives in check and bag my biases in order to hear the respondents’ voice, what (Seale, 1999, p. 169) terms; “allowing voices that are otherwise suppressed or contradicting to emerge.”

I experienced more of this aspect during my interviews with the learners; because of their limited knowledge on indigenous knowledges within the context it was being discussed. I was many times tempted to give “small lectures” on the topic of indigenous knowledges and the environment, but I had to bracket my feelings and allow myself to have an open mind. This seemed to be in tandem with what Bryman (2008) suggests that social researchers should be self reflective about the consequences of their methods and values, biases and decisions for the knowledge of the social world they create.

Therefore, being aware of my biases and my role as “observer and writer”(Bryman 2008, p.282) I tried to be objective acknowledging the implications that my influence would have on the results so as to depict not what I want but the authenticity of the respondents’ experience. This “striving for one’s sensitivity about one’s prejudices and one’s subjectivity involves reflexive objectivity” which according to Kvale (2009) is being “reflexive about one contributions as a researcher to the production of knowledge” (p. 242).

3.10 Reliability and validity

The viability of any research lies in its authenticity. Reliability and validity are concepts that are generally connected with the trustworthiness, strength and transferability of knowledge (Kvale, 2009). Validity in social sciences depicts whether a method investigates what it

claims to investigate. It refers to truth, credibility and strength of what it says (Kvale, 2009). Furthermore, validity authenticates the research (Cohen et al. 2000). This is further asserted by Bryman (2008) when he states that “although validity and reliability are analytically distinguishable, they are related because validity presumes reliability”, in other words, without reliability there is no validity (p.153).

I was concerned about the validity of my research because an invalid research is worthless. Kvale and Brinkmann (2009) argue that validation should not only be a premise of selected parts of the research but instead should permeate all stages of the research project. This made me aware of the need to cross check the various aspects ,for example, the research questions, the sampling procedures, the ethical issue, to mention a few and indicate where I was not sure.

To ensure the validity of my study, I continuously referred to the research topic, questions, and the interview guide was thoroughly checked from time to time for ambiguity and omissions, also to ensure that the focus was being maintained. During the interview processes, some research questions and interview questions had to be rephrased and repeated to ensure clarity. Sometimes I read back and re-echoed what the respondent was saying so as to avoid distorted interpretations and try to get what the respondent meant, at the same time being conscious of my biases (Maxwell, 2013). Simple questions like, “did you really mean?” or “did I hear you saying....?” (Kvale, 2009, p. 217) helped in establishing clarity so that it was not left to the researcher to create meaning. Bryman (2008) calls this respondent validation while Patton (2002) calls it “member checking” where the respondent is given a chance to verify what has been captured by the researcher.

In the same vein, reliability refers to the consistency and trustworthiness of research findings and whether these findings are reproducible at another time by other researchers (Bryman, 2008, Kvale, 2009, p.245). Qualitative research according to Bryman (2008) can be difficult to replicate because situations are always changing and can be affected by a number of factors.

Triangulation of data collection methods through the use of semi-structured interviews, non-participant observations and document analysis as methods of data collection provided a way of cross-checking my data as it was being collected and analysed. This helped in strengthening the findings as discussed earlier in the chapter.

In Validity and reliability, the craftsman and credibility of the researcher is pivotal as it enhances fellow researchers to ascribe to the validity of the findings reported (Kvale, 2009). To ensure the above, I attached more value to class seminars, Peer reviews and took note of the feedback given, in order to check for clarity, correct omissions and misconceptions in any category pointed out from the wider perspective of a multicultural classroom.

3.11 Ethical issues

Research ethics as a concept refers to “a complex set of values, standards and institutional schemes that help constitute and regulate scientific activity”(NESH, 2006). I refer to ethics as a set of norms and values that spell out what is acceptable and not acceptable when conducting research. Ethics embody values that authenticate the research and is based on the relationship of trust and loyalty among participants, research sponsors, supervisors, universities and professional organisations and societies(Scheyvens & Storey, 2003).

Therefore, ethical issues cannot be ignored especially when dealing with human beings as research participants, as Bryman (2008) notes that researchers should take into consideration how they treat people on whom they conduct research to ensure that they are kept from harm's way (p.113). In as much as this topic of research did not involve confidential considerations, I was conscious of the naivety of doing research without taking into consideration the fact that whatever the topic of discussion, human beings have feelings and are open to interpret issues from their own perspective. With this in mind, I therefore took into serious consideration various ethical issues for example my personal integrity and choice of research procedures, anonymity and confidentiality, informed consent, to mention but a few.

Before the field work regarding schools, permission was obtained from the respective District Education Board Secretaries' offices to conduct research in some selected schools and at the end of my research activities in each of the respective schools, I signed in the school log book. This helped to ground and legalise my presence in the various schools that I went to. Issues of anonymity and confidentiality were dealt with to ensure that the identity of the participants was private, though the challenge was that some of the respondents wanted to be acknowledged. The issue of informed consent was taken care of by informing the respondents about the purpose of the research, and the fact that I was going to record all the interviews and will use the information in the thesis. The respondents were informed that

participation was voluntary and they were not under any obligation to stay and answer all my questions and could leave at any stage if they wanted to.

Being a research involving indigenous knowledges, I was aware of the need to respect cultural views and expressions of the respondents. Caution was exercised especially when views that were not common to everyday rational thinking were expressed. This came more to light when issues of practical applications of indigenous knowledges in agriculture were discussed for example the use of certain herbs in healing or the ancestral shrine and its place in their farming lives.

3.12 Limitations of the study

The first limitation was the challenge of making appointments and interviewing the people in higher offices at the CDC. They kept postponing the appointment for three weeks. I had my time calculated but this kind of postponements wasted some of the time that could have been utilised otherwise. Kvale and Brinkmann (2009) warns about the difficulties associated with conducting interviews with elites, who are leaders or experts in the community, and the power asymmetry that may arise as they ascribe to some issues because of their standing in government.

Interviewing the village headman and to some extent the learners had the language difficulties attached to it. Some issues were probably “lost in translation.” Although I am able to speak Tonga which is the language of that province as my third language, some issues under discussion like ancestral shrines made me aware that I was limited in my expressions and probably lost some valuable data.

My own desire and bias toward IKs was another limitation which could have influenced my data collection especially through interviews, it was possible that I could hear more of what I wanted to hear and not what the respondents were implying.

The limited time and financial resources available compounded with the geographical locations of the research sites that were far apart, confined the study to the southern province. This limits the research in that the research results are specific to the province and schools that took part in the research and therefore should be generalised with caution.

Finally some of the respondents expected some form of remuneration in terms of agricultural inputs like seed and fertilizer or even to link the farmers to a non-governmental organisation that would support their farming activities. I took some time to explain the purpose of the research and the fact that this was an academic endeavour meant to inquire into the value of indigenous knowledges with hope of reclaiming its value in sustainable agriculture.

Having discussed the methodology of this research which basically was the data collection process, the next section looks at the research findings.

4 Research Findings

The dislocation of indigenous knowledges in the curriculum and in the classrooms of the south seems to signal that western knowledge/epistemology is the only game in town and that indigenous knowledges are more or less irrelevant in addressing the critical global issues of our time. I join those scholars and activists who want to resurrect indigenous knowledges from oblivion....claiming that IKs have important assets that need to be seriously considered in a world that is completely dominated by western epistemology and knowledge production (Breidlid, 2013, p.3).

In view of the ecological crisis affecting the whole planet, Zambia like many other parts of Africa has its share of environmental problems including deforestation, air and water pollution, land degradation, inadequate rainfall, depletion of fish and wild species. Given that the majority of people depend on natural resources for their livelihood, environmental problems will always undermine the future of the people. Agriculture plays a pivotal role in relation to sustainable land use. Moreover, land is the home for nature's biodiversity and if agriculture is well practiced it leads to conservation of natural resources contrary to what is happening to our planet and our country.

Some scholars show that indigenous knowledges encompasses valuable and timely values and messages that can be incorporated in agricultural science, while at the same time it would bridge the gap between the home knowledge of the learner and Western knowledge while promoting the much needed values of sustainability and care of nature (Breidlid 2013, Emeagwali, 2003). Indigenous knowledges counter Western knowledge of human supremacy over nature and instead in their holistic approach foster the concept of human being as steward of the earth.

The findings from the fieldwork presented in this chapter are based on the semi-structured interviews conducted with various respondents, a document analysis of the Zambian secondary school agricultural science syllabus and non-participant observations carried out in selected schools.

As mentioned in the methodology chapter, a total of 28 interviews were conducted comprising of 18 learners, 5 teachers, 3 curriculum specialists, an agricultural extension officer and one village elder.

The findings to the research questions are presented using as much as possible the respondents actual words "to allow the reader to enter into the situation and thoughts of the

people represented in the research”(Patton & Patton, 2002, p. 503). This is an attempt to make my respondents’ voice to be part of my study.

4.1 Local interpretation of indigenous knowledges

It was important to first establish the respondents’ understanding of indigenous knowledge, because as previously stated in the methodology chapter, IKS are a new area of research in the Zambian context. The understanding of IKS by all the respondents sets the background from which they are operating. Nevertheless, all respondents understood IKS as a way of life, as knowledge that was acquired from the shared life of the community and was orally passed on from one generation to the next. Some of them had this to say:

IKS are part of what I have lived, what my parents and my grandparents lived as coming from the village, it is what I have heard and seen being done here at home in the villages around and it has been orally passed on. It is our way of life (Village elder, 2013).

what I see and know, when people use barks of some trees and leaves to deworm cattle, when a cow breaks its leg and one ties some leaves on that wound and the fracture heals, when a cow gets pink eye and you crush the skeleton of a snail and give that powder in the eye, it clears. These are things that people know and they are not found in books (Agricultural extension officer, 2013).

IKS are knowledges that are acquired within a particular society; we can also refer to them as a traditional way of life and doing things for example here in Tonga land. It is teaching that leans more on preservation and reduction of anything that would destroy our earth, water or reduce the quality of life on our planet (Teacher, 2013).

IKS are local knowledges that are never integrated in our learning, they are primitive and looked down upon, not scientifically proven and not in any of our text books (Learner from the city school, 2013).

From the respondents’ responses, it can be noted that, the respondents exhibited a basic understanding of IKS since they were all able to define IKS in their own words and understanding. Since the backdrop of this thesis is to establish the integration of IKS in the teaching of agricultural science, keeping in mind the environmental degradation that is affecting the whole planet and especially the Southern province of Zambia, it is imperative to see how the respondents link IKS, agriculture and environmental degradation.

The next section looks at how the respondents link agriculture and environmental degradation.

4.2 Agriculture

Agriculture according to the Dictionary of environmental conservation is “the practice of cultivating soil, growing crops or raising livestock for human use, including the production of food, feed, fibre, fuel or other useful products” (Park, 2013, p. 12). Traditional agriculture is defined as that “which is based on traditional farming practices such as crop rotation, use of animal manures instead of chemical fertilisers and of use of animal power rather than machines” (p. 438).

4.2.1 Linking agriculture and the environmental degradation

In relation to how the agricultural science syllabus is linked to the current ecological crisis that is affecting the whole planet and the impact on Zambia’s farming community in particular, all the respondents indicated that agriculture is very much intertwined with environmental issues. According to them agriculture is about utilisation of land for the human benefit, yet “as we try to utilise this land, we are affecting the environment through pollution, erosion of soil and land clearing which does not only affect the land but also the animals that live on that land as their habitat” (Curriculum specialist, 2013). Other curriculum specialists asserted by saying:

The serious connection between the curriculum and the ecological crisis is that we are teaching about these modern technologies, these big machines that are destroying our land. Our forests are disappearing as we boost agriculture. Today one farmer can consume more than ten thousand hectares. Apart from that our rivers and streams are being polluted because of chemical use and all these are degrading the land (Curriculum specialist 1, 2013).

Being a subject, agricultural science provides for the care of the immediate environment so as to sustain the agricultural benefits, it aims at teaching learners holistically and a realisation that what is happening elsewhere is catching up with us (Curriculum specialist 2, 2013).

From the teachers' perspective, agricultural science is dependent on the environment but the syllabus does not contain a big portion of what is happening in the environment. The respondents pointed out that "agriculture now encourages maximum production and soil is highly fertilised for high yields – apply as much fertilizer as possible, then produce more, which in turn destroys our land" (Teacher, 2013). She went on to give an example of what is happening in her village.

I was not taught this but what I see in my own village is that we have huge pieces of land where we used to get high yields and now we are hardly getting anything. Even if we apply artificial fertilizer, the yields are very low because soil is totally destroyed, even the natural grass that used to grow there is gone, trees are only small shrubs left, and even the villagers know that fertilizers and chemical sprays are what has destroyed our land (Teacher, 2013).

Most learner respondents associated agriculture and environmental degradation to the demands of civilisation and the modern world;

The change is due to civilisation and the modern world that we have now, in the old days we are told they never grew large pieces of land but for home consumption. They were not many people in Zambia as there are now. But now because of technology and civilisation, we have to use and borrow from other countries ideas so that we improve and not from the local because this needs a lot of labour so that we can grow things on large pieces of land. Agriculture encourages us not to cut down trees because it destroys the environment and we need to conserve other species but then we need the money and the food as well as civilisation, which is how we end up cutting down trees (Learner, 2013).

From the respondents' perspective, environmental degradation is a result of agricultural activities, mainly attributed to modern technology and clearing of huge pieces of land. In the southern province, the land has always been productive because this was "Zambia's bread basket" but not anymore. I wanted to find out what could have led to this state of affairs. One of the teachers however has this to say;

The introduction of farming equipment has made work easier, we can have bumper harvests and since marketing has come with Western knowledge, people can sell excess which is another form of sharing because our agricultural sector has grown in a lot of ways (Teacher, 2013).

From the mixed responses coming from the respondents, I wanted to hear and establish from the start if the respondents were romanticising IKs and suggesting that they do away with Western/conventional methods of farming. To the contrary, AEO clearly indicated that traditional farming had its own limitations, hence the need for incorporation of ideas and not abandonment. The AEO's stance was that in all their lessons, they tried to mix the groups so that the young could learn from the old. The following views were expressed:

There is need to bridge the gap between the IKs and the modern methods. The whole aim is to preserve the environment and promote sustainability. Both knowledges can learn from one another, that is why in our training sessions we always have mixed groups and we make it as practical as possible. (Agricultural extension officer, 2013)

Having discussed the link between the soil degradation and agriculture, I wanted to establish how they connected agriculture to land sustainability. The next section therefore discusses the link between agriculture and land sustainability.

4.2.2 Linking Indigenous agriculture and land sustainability

All the respondents raised concern about what is happening in the Zambian agricultural sector. According to them, degradation of the soil and loss of fertility on the farms in the Southern province is being attributed to the use of conventional methods of farming, which is representative of most farms in the country. Conventional methods of farming are seen as beneficial in terms of labour efficiency and but at the same time is responsible for the ecological imbalances that are making farming difficult and a failure especially in the Southern province. The dilemma of most farmers in the province being that, previously they grew healthy crops without using fertilizers and pesticides, but with the emergence of conventional methods that is becoming almost impossible. The village elder pointed out that;

When some farmers are producing thousands of bags of maize because of using fertilizers and pesticides, it becomes difficult for another farmer to watch at a loss producing just a few bags, as they feel left behind. The land is no longer becoming responsive to the traditional ways of farming and the animals are being plagued by various diseases that are expensive to treat with conventional medicines. Other day to day living expenses for example; children's school fees, medical expenses are needed. This in turn is what makes conventional farming attractive and draws us into conventional farming methods (Village elder, 2013).

The village elder spoke with a lot of regret and sadness for the high levels of infertility of land. He gave examples of how they used to control pests in the fields without using chemicals by narrating how they used to control army worms in the field of maize by simply catching one of the caterpillars and roasting it on the fire and the rest of the army worms would flee from the field. To give another example, he went on to say;

With us here, although traditionally we had and still have methods of growing crops and taking care of animals, that knowledge is being suppressed as a result it is said to be inferior, otherwise if it were not like that there are certain things that were done traditionally. For example in crop production, they never used to spray chemicals on their fields for fear of killing all the other insects and so they used wood ash and that eradicated the pests. In animal keeping certain herbs were given to animals whenever there was a sign of illness (Village elder, 2013).

Some respondents, though in the minority felt that their ancestors seemed to have had a special relationship with nature in that trees were highly protected, as one of them pointed out:

Traditionally there was no indiscriminate tree cutting; people had proper knowledge of trees and their uses. There were trees for charcoal, for making boats, for making cooking sticks, for making stools, for making drums-when they went to a tree, they only cut odd the part that they needed and not the whole tree-they had respect for trees, they also had friendly methods of tilling and handling the soil.(Teacher- 2013)

According to some few teacher respondents and the village elder, the Tonga people attach a lot of value to some trees for various reasons as was stated by the village elder, that wild fruits apart from being of nutritional value have medicinal value, for example he went on to say:

Magwilinti was used for treatment of blood pressure, *'Masuku'* for treatment of diarrhoea. Moreover, the *'Masuku'* tree was a sign of what was expected in the weather patterns. When the *'Masuku'* tree had a lot of fruit on it, we knew that there was a hard year of drought ahead and vice-versa. People now own trees and even harvest the fruits even before they are ready, just to go and sell. The economic value attached to all these commodities is eroding our values of community and culture. It is destroying our indigenous knowledge (Village elder, 2013).

According to the village elder and some teachers respondents, changes in the weather patterns evidenced in little or lack of rainfall, the violent, frightening lightening and the harsh rains

are all attributed to the break in the bond between the Tonga people of the southern province and the sacred rain ancestral spirits.

The Lwiindi traditional ceremonies for the harvest and thanksgiving have become political arenas and market places for selling merchandise. The rich lessons that should have been passed on in these places as part of the Tonga heritage regarding agriculture and the land seem to be lost. Lwiindi⁷ has lost its grip on what it was originally meant for. Lwiindi is a time of preparation for the planting season, the preparation of the seed and asking the owner of the earth that the good that happened on the land in the past year should happen again in the coming year. There is a lot of concern for the future generations - that what we have received, may it be given to the future generations. Looking at what is happening now, we are not preparing for the future generations, and all we are doing is destroying. Lwiindi would have preserved these practices especially the sacredness of the earth and all that it contains (Village elder, 2013).

There are lessons to be learnt and passed on, however the sacred non-formal learning space according to the village headman was losing its grip on the values of the Tonga farming community. He went on to mention that all lessons regarding each farming season in terms of preparation of land, planting, harvest and thanksgiving took place at this ceremony which was and is still conducted at the sacred shrine of the 'rain makers' called Gonde in chief Moonze's area. This was a communal non-formal learning space which acted as a communication ground and from the village elder's point of view the knowledge they acquired was complete.

In addition to this cultural rain ritual at the shrine, the AEO expressed concern over the loss of the indigenous seed which is responsive to the climatic conditions of Zambia as opposed to the hybrid seed which yields high but needs a lot of other manipulations, like fertilizers, pesticides and a lot of water. A major portion of agriculture in Zambia is rain fed. According to the Agricultural Extension Officer (AEO); within the COMESA region (Common Market for Eastern and Southern Africa) there was a seed trade harmonisation regulation that is coming into effect in 2014. This would disadvantage the small scale farmers and advantage the large multinational seed breeders moreover, he went on to say; "it will be illegal for your mother to give you indigenous seed. That will be an area within the indigenous knowledge

⁷ Lwiindi is a traditional ceremony of thanksgiving where everybody is taught to be grateful for nature and for what mother earth is able to provide, and that human life depends on this planet for sustenance and therefore when harvesting, people thank the provider and renew our commitment to care for mother earth.

that will be lost” (AEO, 2013). Moreover, he felt that it is important for the government to take into account that:

Seed farmers have their own seed and they are told to buy hybrid seed so that they can yield high but forgetting that the hybrids need chemical fertilizers. In this so called ‘green revolution’ we are losing a huge amount of indigenous knowledge. The indigenous seed is supposed to help in times when there is less rainfall and still maintain its nutrition as compared to hybrid seeds (AEO, 2013).

Land degradation according to the AEO is brought about by the pressure on the farmers arising from the so called “superiority” of the Western knowledge with its’ conventional farming methods that have adverse effects on the environment (mass production, use of chemicals, deforestation, loss of local seed etc). However, most of the teacher respondents appreciated conventional methods of farming and one of them said, “Globalisation has opened up the market for us and we are able to produce more and sell to other countries. We are able for mass production through tractors, hybrid seeds and other technologies” (Teacher, 2013).

Having discussed indigenous knowledges and agriculture, the next section will look at the hegemony of Western epistemology to see the influence it has in the Zambian agricultural science education.

4.3 Hegemony of Western epistemology

When comparing indigenous knowledges with Western knowledge, all teachers, learners and curriculum specialists noted the long standing hegemonic influence of Western knowledge on the Zambian educational system. At the same time there was an inherent expression of contentment because “Western knowledge is everywhere, we are teaching these young people so that they can fit into the wider world, they can compete for jobs on the international market and they can competently argue scientific issues anywhere in the world” (Teacher, 2013). One of the pupils even said; “we feel it would be difficult to understand indigenous knowledges because we were brought up with western knowledge” (Learner, 2013). The respondents’ affinity to Western knowledge was asserted by the teacher who said;

Western knowledge is liberal, open to sharing and not rigid and does not hold on to what it has. It brings on a global interconnectivity and you are able to interact and get ideas even from very far. While IKs are mostly secretive and very often would

not want to share easily because of the taboos attached cause suspicion (Teacher, 2013).

The idea is discussed in the theoretical framework but it is worth noting how this influences the curriculum and the indigenous agriculture. In addition it was noted that most respondents could easily relate to Western knowledge and could easily point out a lot of positive attributes in relation to the same. For example one curriculum specialist said:

Technology e.g the internet enables pupils to have different perspectives over things and they don't have to depend on the teacher or their parent all the time to find information. Our children now have all the information that they need. (Curriculum specialist, 2013).

The next section looks at the effects of the hegemony of Western knowledge on the school curriculum and indigenous agriculture, bringing out struggles teachers face as they make choices on which knowledge to emphasise.

4.3.1 Effects on the school curriculum

The teacher respondents noted the inferiority of indigenous knowledges and how the two knowledges are not equally weighted in the classroom. They attributed this to the way the Zambian education system is made (patented over the British system and British curriculum). One of the teachers bluntly stated; "what has been proven scientifically is what is considered knowledge, so much that traditional knowledge has no space" (Teacher, 2013). Furthermore, the Eurocentric curriculum places emphasis on rational thinking therefore creating a lack of confidence in Iks. This was reiterated by another teacher who said; "our education system is very western and it needs to be helped, it does not support Iks," (Teacher, 2013) while another said:

Our minds and attitudes have been conditioned that what comes from the West is potent because it is scientifically tested and good, yet in practise even the herbal medicine does cure animal and crop diseases. We need to have a mind-set shift to acknowledge and value what is here and know that it is as good as what comes from the west (Teacher from village school, 2013).

I don't think most learners would be interested in learning Iks because it is not taught in our schools and this makes most young people fail to stand up proudly for it (Teacher from town school, 2013).

In addition, one of the learner respondents stated:

I think I will have difficulties to grasp what is discussed in IKs because of my Western knowledge influence. Moreover, I was born in town; I have never been to the village. I think we have just changed because even in our eating habits, dressing habits, and talking habits.....I think we just look at life differently (Learner, 2013).

For some learner respondents, there was need to put in some effort to move their interest towards IKs as they generally indicated that IKs were not really knowledge that they were proud of as most of them were ashamed of being associated with it. This came out in words like:

It is not easy, we need to move away from the shame we feel about our local knowledge and the theories we have of it, instead develop interest to know, so that we acquire the knowledge (Learner, 2013).

For the curriculum specialist, the power of western knowledge was viewed as an addiction, which has been comfortably lived with.

IKs are not popular and are shunned because all we know is that knowledge drifts from the North to the South, the North is busy in their laboratories with research and need to market that knowledge. Little knowledge moves from South to North. We have become addicted to the white man's knowledge and don't have a chance to think and develop our knowledge. I also realise that government policy plays a big role in that, it would be helpful if we could encourage our own research and innovations, but we have lived with the fact that the white man's knowledge is rich information that can be used in many ways which I also agree with. Yet there is still more in IKs that would upset what is obtaining (Curriculum specialist, 2013).

I will now explore the effects of the hegemony of Western knowledge on the local farming methods, bringing out the peoples' dilemma as they try to make their farming decisions and choices.

4.3.2 Effects of conventional farming methods on agriculture

Most respondents appreciated conventional farming methods in their innovations and as solutions to food security due to their quick mass production but they are also seen to be responsible for the ecological imbalances that are making farming difficult. Some of the respondents pointed out and blamed government for putting a lot of emphasis on economic gain and passing agricultural policies that supported mechanised farming though detrimental and not sustainable to the agricultural sector and the environment. Most of the foreign investments in the agricultural sector in Zambia are perceived by respondents as coming from Western multinational companies that required huge pieces of land. The agricultural extension officer pointed out that:

It is scary to see what is happening to large parts of Africa where huge chunks of land are being taken over by western companies and huge machinery is applied therefore destroying all the biodiversity (AEO, 2013).

The AEO further pointed out that the industrialised model of farming, while producing the much needed agricultural products in large quantities, is also causing massive damage to the environment and is responsible for climate change, making the soils less productive.

According to him, the conventional model of farming encourages people to clear huge pieces of land and then use a lot of fertilizers, which encourages acidity that most of the farmers would not know how to get rid of. Where they are taught to use lime, most of them cannot afford it because it is expensive; therefore they just abandon that land after destroying it. According to the AEO, it was important for people to decide what they want for the future, otherwise;

The industrialised model stresses on 'big is better', large pieces of land are being cleared of trees using large equipment forgetting about the small family farm that can have a lot of diversity. Actually the small family farm can outperform the large hectareage though it is labour intensive and the farmer has to be very active (AEO, 2013).

In the same vein the AEO further noted some woes of the industrialised farming methods stating that people know that fertilisers destroy the soil. Nevertheless, that in the last 60 years through the industrialised model of agriculture, they had concentrated on the chemistry of soil nutrients and emphasised on plants needing nitrogen, phosphorous and potassium while ignoring the soil (feed the plant and ignore the soil). At that time soil was only seen as the anchor for the plant, but IKs emphasises on feeding the soil so that it will feed the plant. Hence soil in organic farming is seen as a biological active component with all the living organisms that are working away to make it all richer.

However one curriculum specialist appreciated the conventional methods of farming and for him, the answer about Zambia's food problems could be sorted out by the conventional farming methods as he stated:

As for the appreciation of IKs, it is very difficult to say maybe given time, some sections of the society will appreciate IKs. Otherwise as at now, agriculture is about using the land for human benefits to develop the country. There are a lot of agricultural investment projects that have created jobs; we have the Environmental Council of Zambia (ECZ) and development projects that are monitoring projects. Some projects are doing so well and have put us through to the international

market, so why would the government go against such? (Curriculum specialist, 2013).

Another teacher pointed out;

Globalisation has opened up the market for us and we are able to produce more and sell to other countries. Mass production comes with benefits (Teacher, 2013).

Having looked at the effects of the hegemony of Western knowledge on the school curriculum and how conventional methods are influencing agriculture, I turn to the school curriculum and discuss localisation as an attempt into the integration of IKs in agricultural science to make learning relevant to the learner.

4.4 Localisation of the curriculum

Localisation of the curriculum makes the curriculum flexible and responsive to the learner and societal needs. However, some respondents pointed out the disconnectedness of the curriculum to the learner's home environment evidenced in the lack of inclusion of indigenous knowledges in the curriculum and the lack of explicit emphasis on the IKs dimension in agricultural science. As one of the teacher respondents noted:

It carries very little of the children's home experience. Sad though at this time when our whole planet is upset and our land is becoming barer because of facing human destruction. If our children were well taught, they could carry these lessons through life and they would be the advocates of the preservation of the environment. But since our children learn for the exam, and it is very separated from their daily experience, they don't carry anything (Teacher, 2013).

From the curriculum developer's perspective:

I am aware that IKs are not appreciated; learners don't connect what they learn from school to home. That is why we are trying to look back as we realise that we have drifted away. Where we are even giving the guided knowledge and encourage a lot of innovations. Otherwise, I do appreciate IKs, change is difficult to accept, it is also costly, but it will definitely come someday with some benefits because we cannot just sit and say this is expensive, we need to move with the rest of the world, knowing that what is happening elsewhere is slowly catch up with us (Curriculum specialist, 2013).

The teacher respondents expressed the fact that they had very little control over what they were supposed to teach. This was because the syllabus was made by the MOE at the CDC and came with already prescribed topics and text books to follow. One of them had this to say; “to avoid teaching wrong information, we use text books especially when we are not sure about the topic. The text book keeps me on track” (Teacher, 2013). Some teachers expressed inadequacy when it came to teaching IKs because their training as teachers had not prepared them for that as one of them said:

As teachers we are not prepared through our training and we are not really trained to interpret IKs in our agricultural science content, all we know is that we have to prepare the learners for the global world (Teacher, 2013).

Moreover, the teachers expressed the need to cover the relevant topics in preparation for the national examination. Another teacher asserted by saying: “Our syllabus comes already prepared for us and we have to teach what is already prepared because that is where the examination is” (Teacher, 2013).

In order to localise the curriculum IKs have to be part of the content of the curriculum. The next section explores how much of IKs feature in the agricultural science syllabus.

4.4.1 Indigenous knowledges in the agricultural science syllabus

When I asked on how indigenous knowledges are presented in the agricultural science syllabus, one of the subject specialists indicated that the syllabus had drifted away from IKs because of technology and mass production, and the need for a lot of food for the growing population. Therefore “our syllabus tends to move away from traditional methods and somehow we are realising that, so we are pressing on issues of conservation farming and agro-forestry” (Curriculum specialist, 2013). She gave an example of how traditionally trees called ‘*Ifinsa*’ and ‘*Mubanga*’ were never cut down because they are a sign of water and wherever they grow, they signal water. This was asserted by one teacher who said:

IKs are not in our syllabus, they are not taught, the knowledge is lacking and our pupils do not appreciate it now. May be at a later stage because of what is happening with people suffering from HIV/AIDS, people are now going back to traditional medicine. Though being too traditional sometimes comes in terms of not

knowing the concentration of the herbal medicine. That is why we need the integration so that it is improved on (Teacher from the rural school, 2013).

Another teacher bluntly echoed:

If IKs feature in our syllabus then it is hidden, because if we look at topics like agro-forestry, bee-keeping etc. Practical, agricultural visits, field trips are rare. Our children now do not appreciate IKs because there is scanty information on it. What we need to do is to bring the two knowledges together, they are both rich, let us have it incorporated into our methods of teaching (Teacher from the city school, 2013).

Another curriculum specialist pointed out, how the agricultural science has become more and more business oriented. Even though the three subject specialists interviewed all indicated mixed feelings about their value of IKs, one of them openly said;

but if we talk about IKs, that is a grey area so to say because we are not only focusing on what used to happen in those days because agricultural production is linked to sustaining the market out there and that is what brings in thinking very quickly about how do we multiply the yields and boost the economy, given a short period of time and that is how the issue of chemical fertilisers, cross breeding come in so that we can have increased production. So there is very little of indigenous knowledge, for example the *Chitemene* system (Swidden agriculture) that we are now discouraging and yet at that time they used it to rest the land and allow for recovery (Curriculum specialist, 2013).

From the teachers' perspectives, IKs are not really emphasised in their teaching and learning. One teacher bluntly said "it is not even there in the syllabus because we are all teaching the borrowed syllabus from the developed nations; it is just being pressed on us to teach their culture using their way of doing things" (Teacher, 2013). Another teacher from the rural school went on to say;

Indigenous knowledge is not reaching our classrooms. Our learners from the village might have an idea of some of the indigenous methods of treating animals or destroying some crop pests but that cannot be brought to class because it is not valued and recognised. Pupils from the towns have very little IKs (Teacher, 2013)

The teacher respondents also mentioned that IKs are very much viewed as being too traditional and backward that those views eroded the teachers' confidence in even trying to bring the IKs concepts into the agricultural science classroom. As one teacher from the rural school noted:

As a teacher, I know that I can use the sausage tree to treat Newcastle disease in livestock because I grew up in the village, when I crush that fruit and put it in the water and give the animals to drink and yet I cannot freely go to class and tell my pupils because it is not scientifically proven. I would be happy to give my learner as a JETS⁸ project but at the same time I would be apprehensive in case they ask the pupil to produce proof-what would she do? Learners are not given a lot of hope to proceed with certain innovations from the local knowledge for fear of the same-proof (Teacher, 2013).

On the other hand, both teacher and learner respondents perceived the examination orientation of the agricultural science syllabus as the killer of the practical teaching dimension of the subject. This is due to its' emphasis on rational ideas and the centrally set exams. Practical lessons are viewed as one of the areas where learners can come in contact with some IKs. One of the rural teachers felt that agricultural science is meant to be a practical subject though it has lost its practicality over time and is becoming more and more academic and examination centred. Another teacher went on to say;

In my teaching experience of 28 years, I see our syllabus, our teaching and the recipients of the knowledge just learning for the examinations and hence cannot use the knowledge they gain from school. If they were taught more practically, it would help as at now there is too much spoon feeding and theorising of concepts and book knowledge (Teacher, 2013).

However, one of the teachers felt that even if the learners have to sit for examinations, the learners in the process learn to compete and acquire a lot of knowledge that makes it easy for the learners to go abroad and still fit in with other countries.

Most of the learner respondents expressed dissatisfaction on the way agricultural science was being taught. Learners from both the rural and city schools lamented on the lack of practical applications in the teaching of agricultural science. Some of the sentiments expressed were:

Agriculture should be done in the field but our school does not even have a field, sometimes it becomes difficult to imagine in our minds what the teacher is talking about (Learner from the city school, 2013).

Certain topics in Biology and agric science involve plants and animals; we would appreciate if our teachers could give us some application of IKs when teaching, for example when we are learning we should be told about what our forefathers used to do with the plants and animals. (Learner from the rural school, 2013).

⁸ JETS (Junior Engineers Technicians and Scientists) are an association of science students from secondary to high schools. They hold different fairs within the year where learners exhibit their innovations in technology.

We do not go for field trips even to some of the agricultural institutes to see what the teacher is talking about in class. We have heard of places like Zambia College of Agriculture, Kasisi Agricultural Training institute or the Natural Resources Development College but we never went there. We are not exposed (Learner from the city school, 2013).

Our teachers also lack indigenous knowledge so they teach us from the text books; text books also have no IKS. Sometimes we have a class demonstration, we write notes and that is all (Learner from the rural school, 2013).

I do appreciate IKS but then our teachers teach modern things for the examinations, if only the examination would be changed (Learner from the rural school, 2013).

From the curriculum specialist's perspective, the lack of well founded proven research in the area of indigenous knowledges in the curriculum of Zambia was proving problematic as she pointed out; "as a teacher you cannot teach assumptions, because a teacher wants proven concepts" (Curriculum specialist, 2013). Otherwise:

For people to appreciate IKS, let there be well founded research in this area and this will help convince people, for example Chitemene as an indigenous method was being condemned through and through but after the Zimbabwean researcher carried out a research it was discovered that it was actually a good way of preserving the soil. There is urgent need to research on indigenous knowledge and then information should be well disseminated. There is a poor dissemination of whatever is researched on (Curriculum specialist, 2013).

Another of the specialists gave an example of the integration of IKS; in the use of *Sesbania sesban*, stating that traditionally people always sprinkled it on the cassava field as an organic pesticide but that through research it was proven that not only does it destroy pests on the cassava but it also provides fertility and kills fish. This pesticide was then banned because of using it for fishing where it killed even small fish. "When we teach conservation now, we are trying to improve on IKS" (Curriculum specialist, 2013).

4.4.2 Medium of instruction

From my observation and through the interview, the Eurocentric curriculum is taught in English and most of the learners though having learnt the language from the time they start school, still struggle with it. Ten out of the eighteen learners interviewed found English as a medium of instruction in class to be a barrier to their self expression and understanding of concepts. While English is taken as the second language and everyone learns it when they go to school, even the teachers struggle with the language as this can be evidenced in the

construction of sentences as they try to explain some concepts in the classroom. One of the learners explicitly put it;

Sometimes English is a barrier, they ask us of things that we know but because we cannot express ourselves because most of us come from the compound where we use local language, when we come to school, even if we think in our local language, we still have to write it in English, we know that we could talk easily in our local language but we cannot say we want to learn it in our local language because that is how it is (Learner from the town school, 2013).

In line with this, most learners expressed their concern on how they are becoming more comfortable with Western culture. They asked questions like: “why as Zambians do we only have to adapt to others? Why are we not proud of whom we are? We need to balance ideas so that we do not lose our own values and culture” (Learner, 2013).

4.5 Integration of IKs into the agricultural science syllabus

The majority of teachers expressed that one challenge in the scanty or non inclusion of IKs in agricultural science teaching is the Zambian education system that is following a centralised curriculum that is too examination oriented. As a result, pupils learn to pass examinations and not to have knowledge and wisdom for life. According to the teachers, examinations pursuit is viewed as limiting to what the teachers can teach and what pupils can learn. One of the teachers from the rural school stated;

A limit is placed on the pupils’ thinking; they cannot think critically, if everyone opened up, there is a lot we can tap into regarding the indigenous way of agricultural practices. Think of things that have always been there like *Aloe vera* and *Moringa*, which are now surfacing like new knowledge in the books. Look at the people of the Gwembe valley who have always fed on these plants as vegetables-those people grow old (Teacher, 2013).

Asked on what parts of IKs could be incorporated into the school agricultural science, the village elder felt that western knowledge’s emphasis on proof is defeating the passing on of indigenous knowledge. While the elders are willing to pass on the indigenous knowledge, especially in the villages, he felt that taboos connected with IKs are not being acknowledged and recognised and he used a metaphor of “war between tradition and modernity”. When I asked him why he felt like that, he went on to explain that the Tonga people as

agriculturalists have always had their traditional ways of tending their fields, which now looked primitive and backward.

Majority of teachers associated their failure to integrate IKs into the practical agricultural science lessons to fear of being said to be primitive and backward by their learners. One teacher pointed out how he grew up in the village himself, listening to stories from his grandfather about farming and how he grew up believing in those stories. He felt that he had rich experiences of growing crops and taking care of animals traditionally, incorporating soil fertilising processes by growing indigenous green manures like velvet beans and sun hemp. However, he most times could not openly discuss these IKs with his class because of fear and shame of being labelled backward.

In line with the same, another teacher narrated his experience of how the elderly school herdsman treated a cow's fractured leg without using any conventional medicine, which would have been a worth experience to bring to the knowledge of the learners in the classroom and yet did not. He had this to say:

I had some experience three years ago, one of our herdsmen let the animals roam in the compound and it was found that one of the animals broke its leg to the point that the bone was protruding out to the skin. The herdsman brought some herbal medicine from his village which he smeared on the leg of the animal and tied it in with the fibre. After three weeks the animal was able to walk and to this day that animal has two calves and you can see that there was no veterinary doctor involved, just tradition. That is why I strongly feel that if our knowledge was not suppressed we would go very far in developing. When we asked him the name of the medicine, he was hiding because he was not sure how we would all take it (Teacher, 2013).

However, some of the teachers indicated that a few learners are becoming keen to bring out the IKs and all they needed is some encouragement. Learners will only appreciate IKs if their teacher gives them a glimpse of what it contains. With what most pupils are experiencing with herbal medicines, herbal teas, herbal toothpastes, that had become very trendy on the Zambian market; what one of the teachers termed "our indigenous knowledge coming back packaged in expensive packets" (Teacher, 2013). Teachers claimed that some of the learners were coming up with IKs in their JETS projects. At the same time, some teachers were aware that; "If learners are not exposed and taught, they will have lost out on most of the knowledge because most of the people that have that knowledge are dying away" (Teacher, 2013)

These concerns resonated with the AEO's views that:

Modern parents are struggling to connect with IKs because some of them have never been exposed to it and with the looking down upon such knowledge; it is still difficult for some to convince themselves that this is still valuable knowledge. It took us 15 years to realise that we were using bad methods of farming (conventional/industrialised model). We are now promoting organic agriculture and indigenous knowledge because there is a lot that the local knowledge can offer. We are constantly asking ourselves on how we can adapt the knowledge that the farmers have and with some science, improve on it. We realise that farmers have a lot of indigenous knowledge but the west has snubbed that kind of knowledge. It is important to find ways of documenting it so as to keep it alive for the younger generations, in the state it is now and the way our country does not put a lot of effort to promote it, it is bound to be completely lost (AEO, 2013).

The learners had mixed views regarding the inclusion of IKs in their learning. Some learners felt that they lack information and understanding of IKs because they are not taught and it was not in the syllabus. Majority of learners felt that they can do without it, because it will be difficult to understand IKs as they have been brought up with western knowledge and they value modern technology. Others mentioned the lack of government support for not promoting IKs in agricultural science and the inequality of ideas between IKs and western knowledge. Some complained about their agricultural science projects that involved their own innovations with IKs not being exposed and lacking follow up and above all the fear of being labelled backward, primitive and being associated with witchcraft as most of traditional knowledge is stereotypically connected to witchcraft. The learners find themselves in a dilemma, as one of them stated:

Most subjects do not mention IKs instead concentrate on modern things because we have to catch up with the modern world. Sometimes it is hard to know what we are missing, especially when our parents and teachers do not tell us about it then we wonder, is it a value (Learner, 2013).

4.5.1 Practical suggestions of IKs content for the syllabus

On a practical note, I wanted to find out from the agricultural extension officer, being an institute that promotes sustainable agriculture and indigenous methods of farming, on what programmes the institute was running and what methods were being used to pass on the knowledge to the farmers. That would help in establishing what programmes could probably be incorporated into the school curriculum. The AEO explained that the agricultural institute basically concentrated on teaching organic/indigenous sustainable agriculture through 17

different courses using 5 day training cycles while some in-depth courses took 3-6 weeks. They teach mostly practical courses for example composite making, crop rotations, green manure crops like sun-hemp and velvet beans which are very indigenous practices, they also teach black smithing, agro-forestry and animal draft power etc. However he said that:

When young people come to the training, they have no idea about some of these indigenous practices because they just know the modern farming methods. Therefore, to bridge the gap between IK and modern methods, we have a combined group of trainees, 30 percent young people and we use the participatory model where every session starts by listening to the participants so that they can learn from each other (AEO, 2013).

He further suggested a new concept;

In our schools, we need to introduce the concept of 'perma-culture' which is organic farming, which could be part of the basic primary school science-then our learners will grow knowing that it is possible to do it. Also introduce plant breeding as it has been done for millions of years by farmers and our ancestors as they observe certain traits and keep what they want, this will help in the preservation of what is indigenous (AEO, 2013).

Some teachers suggested some of the practical considerations that could be made to include IKS in the syllabus though with a lot of uncertainty. Some of their ideas were:

There is need to incorporate IKS in the topic on soil management. Take the learners to the natural ways of using soil and give it time to be practically proven in the field (Teacher from city school, 2013).

Make the lessons on the conservation of the environment as practical as possible-do demonstrations and let it go on probably for 3-5 years. Use practical examples, for example two pieces of land where two different methods of fertilising is applied (Teacher from the rural school, 2013).

On the topic on crop production which I feel is very mechanically done at the moment, there is need to practically teach crop rotations, values of intercropping and fallowing of land. All these have been thrown out in the quest to maximise profits. Land is continuously cropped and grazed without rest therefore destroying its quality in terms of nutrients, grass and other soil living organisms. Human beings are given a chance to rest but the soil is not (Teacher from rural school, 2013).

Agricultural science syllabus needs to include practical elements of IKS on crop production (acacia tree planting, velvet beans, use of herbs) and animal production. Include some stories from nature. Our syllabus also does not specify clearly the

issues that deal with climatic changes and why traditionally some trees were never cut down. Types of fuel used as energy sources, methods of farming and why we are having seasonal streams (Teacher from rural school, 2013).

4.6 Zambian Secondary school agricultural science syllabus.

The Zambian secondary school agricultural science syllabus is divided into two namely, the junior secondary school syllabus and the senior secondary school syllabus. This syllabus is separate from the curriculum document and both are drawn by the curriculum developers at CDC. The syllabus is an outline of topics to be covered in two years for (junior) grades 8 – 9 and (senior) three years for grades 10-12. The syllabus is made by the Ministry of Education and comes already with its recommended text books.

The agricultural science syllabus requires that those schools that teach agricultural science must have adequate land, agricultural facilities and laboratory space. Practical and field works is viewed as an integral part of the syllabus and are supposed to be covered adequately.

The next section will discuss the content of the two parts of the syllabus.

4.6.1 Junior secondary school agricultural science syllabus

This is the syllabus that covers the two years of junior secondary school education as mentioned above. For a detailed list of topics, see appendix IV. Otherwise basically, it covers six major themes/topics which appear in the following order;

1. Agriculture in Zambia
2. Soil management
3. Farm implements
4. Farm management
5. Crop production
6. Livestock production.

Each of the main topics of the syllabus lists specific objectives which also act as a guide on what the teacher should enable the learners to do at the end of each topic. The syllabus is described in terms of pupil performance giving further guidance on what is expected of the learner at each stage of the unit. However, the teaching order of these topics is left to the individual teacher to decide.

According to CDC (2000) six periods of 40 minutes per week should be allocated of which four of them are taught as double periods for the purpose of practical work. This however is

not the case in all the three schools visited during the research, which have two periods for the practical and three periods of theory.

Learners are examined on the basis of a centrally set formal written examination, by the Examinations council of Zambia (ECZ). The first part of the examination is theory which includes some practical components and makes up 80% of the total marks. The second part is project work where learners are required to show evidence of having done a project and carries 20% of the total marks. According to the syllabus outline, learners maintain a project notebook in which they record their project work. Learners do two projects, one in crop production and the other in animal production. The project work is marked by the teacher and the final result is sent to ECZ for final moderation after the head of department for agricultural science has done the initial moderation.

In this particular study, my focus was on identifying what content of the agricultural science syllabus forms the body of knowledge that could be identified as indigenous knowledge, and how teachers relate to that knowledge. The analysis will be discussed chapter 5. The next section will discuss the senior syllabus.

4.6.2 Senior secondary school agricultural science syllabus

This syllabus came into effect in the year 2000 and is taught from grades 10 to 12, covered in a period of three years. This revised syllabus was meant to lead to sustainable development and some of its major concerns being the environmental education and the full localisation of the high school examinations formerly set by university of Cambridge local examinations of United Kingdom (CDC, 2000). For a detailed outline of topics, see appendix VII. Otherwise, the syllabus basically comprises of the following topics:

1. Agriculture in Zambia
2. Soil science
3. Crop production
4. Forestry
5. Livestock
6. Farm structures

7. Farm machinery

8. Agricultural economics

According to CDC (2000), the syllabus is made of materials selected from all major areas of agriculture. Learners are expected to demonstrate an achievement of general aims of learning agriculture at this level.

Just like in the junior syllabus, 6x40 minute periods per week are recommended by the Curriculum Development Centre (CDC) for satisfactory coverage of the syllabus. However, it was noted that in the city school and one of the rural schools, they only allocate five periods per week, in which three periods are allocated for theory and two periods for the practical lessons.

At the end of the three year course, learners enter for three papers for examinations namely:

Table 2 Examination outline

Name of paper	content	marks
Paper 1	Series of laboratory practical exercises	30 marks
Paper 2	Six simple structured compulsory questions	40 marks
	Three essay questions	60 marks
Paper 3	Long term (3 yr) project work	20 marks

Nevertheless, learners are required to use knowledge and skills and understanding specified by the syllabus to plan and carry out investigations in which they ask questions, plan, predict, hypothesise, observe, measure, record, interpret their results and evaluate evidence. They have to follow instructions accurately for the safe conduct of experiments and practical.

Having discussed the syllabus content, the next section looks at the challenges of teaching IKS in agricultural science.

4.7 Challenges of teaching IKs in agricultural science

Generally from all the interviews conducted, the majority respondents indicated that they are aware of the fact that IKs are not very much appreciated and sometimes rejected because of being an area that has not so much been interrogated, people mostly identify with Western knowledge. Some of the challenges pointed out are that;

Government policy for funding practical subjects is not good; the policy makers have not taken the applied sciences as hard sciences, where more emphasis is placed. Examples of subjects that were negatively affected were agricultural science, home economics and arts. This tends to create a negative attitude from the teachers involved and the learners who are given an impression that the subject is not important.

The lack of proper research in the area of indigenous knowledges is another area that is presenting challenges, because there is no documentation hence no point of reference. Most teaching depends on the availability of text books, and there are no text books with IKs content.

Moreover, teachers feel inadequate because their own training does not prepare them for teaching the IKs content. In addition, teachers cited the pressure of preparing for the centrally set examinations as another challenge, and since IKs are not examinable, they are not seen as urgently needed in the teaching.

For the learners, it is the lack of connection between home and school, for the city schools, what they learn from the tourists and misconceived modernity. Moreover for all the learners, the influence of the mass media and the attraction coming from visual impressions and advertisements is strong.

Home is a very important school for us but our parents have not taken responsibility toward local knowledge, we just see things from our friends in the western world, on the internet and other technology. This civilised world is bringing a lot of new technology, then all these ideas about more investments and more money, so in the end we lose out (Learner from the rural school, 2013).

We copy a lot of things even from the tourists that come. We learn modern things and we spend most of our time on television, internet and sports. Whatever information we need, it is on the internet. Western knowledge is more attractive because it is advanced (Learner from the city school, 2013).

Mostly we look for things that are attractive to our eyes, for example when we are told that charcoal can be for cleaning teeth, it does not look attractive and so we shun it because we are not proud of it (Learner from the rural school, 2013).

The next section will look at how teachers taught using IKs in their classroom methods.

4.8 Classroom methods

All teachers clearly indicated that the commonly used methods of agricultural science teaching was through lecture methods, question and answer, experiments, lesson demonstrations of scientific procedures, group work and the field project work which according to the teachers was a learners' research at this stage. In addition to this, teachers indicated their preference of the learner centred approach when teaching, which was also a syllabus requirement. This though was a challenge when it comes to integrating some IKs in their teaching because both teachers and learners had scanty or no information on this dimension therefore leading to passive learning for pupils. For example; teachers teach what is outlined in the text books. One of the teachers said:

As teachers, we are equally not taught about IKs, I remember my own Zoology lecturer bringing it to our awareness that there is a lot in the IKs that is valuable but not documented and so it makes us get stuck on how to strike the balance, because it is not given the space, it is just shoved aside and forgotten.

4.8.1 *Non-participant observation*

Prior arrangements were made with the teachers to enable me observe lessons where indigenous knowledge was being integrated in the agricultural science lessons, keeping in mind that some of the teachers had stated that they valued IKs though it was not emphasised in the syllabus.

Two classrooms were observed, one in the city and the other in the rural school. In these observations, I concentrated on aspects of the classroom teaching in terms of; how IKs were being integrated in the content delivery and how conversant the teacher was with the concepts and if relevant local examples were being used. As earlier stated in section 4.8 where teachers outlined the methods they use in teaching, I observed that in the lesson in the city school was purely a lecture on soil fertility. The lesson was taught with chalk and board, contrary to what

the teacher had earlier mentioned about being learner centred. The teacher concentrated on giving out facts and made references to the text books, and there was no reference to IKs and neither did the teacher ask the learners about their home experience.

The second lesson in the village school was more a question and answer session. I observed that the teacher tried to integrate IKs into the teaching, which made some learners bring out a little of their own knowledge. The teacher was discussing the grain storage and how to construct the traditional storage basket. He also referred to how people traditionally identify the moisture content in the grain. He used local examples and at the end, he asked the learners to visit the nearby village to see the storage bins.

I was also observing the teacher and learners' attitudes in both instances to see whether the teacher was showing interest in the IKs as they taught and what kind of influence it was having on the learners. At the same time how were the learners engaging with the content, was there active participation in these lessons?

From my observations, the two lessons in the two schools were handled differently, while the teacher in the village school tried to integrate IKs in his lesson and was more learner centred, the teacher in the town school did not integrate any IKs and was more teacher centred. I questioned whether the difference in the lesson handling was the school location or the nature of the topic under discussion.

These lessons helped me to confirm what the majority of respondents had already mentioned about IKs not being really integrated in the teaching of agricultural science. Therefore having brought out the findings from the research, the next chapter will analyse the findings using theories and concepts that arose from the data.

5 Analysis of the research findings

The mobilisation of a conscientised population about the threat to our planet is perhaps the only way to enforce a paradigm shift in the power structures that are not willing or able to come to grips with the situation facing our common earth (Breidlid, 2013, p. 202).

This chapter presents a discussion and analysis of the research findings presented in Chapter four. Although an elaborate discussion on the concept of IKs in general is not within the prime focus of my study, it is its very foundation. Hence, I start my analysis by discussing how local people perceive IKs and how they relate the concept of IKs to the environment. Therefore, including this part in the analysis gives the reader the inkling into the Tonga view of IKs and how they relate IKs to their agricultural practices. Moreover, it is from among the Tonga community of Southern province where the majority of the learners in these three schools come from, hence it is their home environment.

The chapter also looks into how indigenous knowledges are positioned in the agricultural science syllabus and the potential integration of IKs in the agricultural science syllabus. Lastly the chapter looks at Border crossings.

5.1 The concept of indigenous knowledges

Findings from the field work revealed that respondents had different perceptions of IKs. However the general understanding of IKs among the respondents showed the following characteristics; first, they are local knowledges generated within a particular community and they are deeply contextualised and location specific. Secondly, they are metaphysical and holistic in nature and finally they are not documented but orally passed down from one generation to the next.

One of the main discussions in this thesis is the contest of the two knowledge systems where the Western world view portrays IKs in a derogative manner whereas the owners of the IKs see them as a way of life and therefore regarded as a tool for survival. As discussed in the findings chapter, many rural respondents focused on indigenous agricultural practices, for example in the use of herbs, ancestral spirits and other traditional rituals that were a basis of people's decision making in their every day agricultural lives. However, the study in chapter

2 established that the West often seems to perceive such practices as irrational, mythical, unscientific and superstitious, therefore, seen as being incapable of contributing to their view of development. As a result Western agricultural knowledge, through the global architecture of education, has come to dominate agriculture in the Global South as evidenced in the use of modern technology.

The informants had different perceptions of IKs. The findings seem to imply that the rural informants have a positive view of IKs in relation to their use in agricultural practices in the traditional communities. The village elder and the AEO viewed IKs as being knowledges that encompass a peoples' culture, and are a vital source of a complete way of life of the Tonga people. This is because IKs in traditional societies reflect how people lived, how their forefathers and mothers lived and practiced agriculture with a focus on conservation and preservation. This ecological perspective is in line with scholars like Breidlid (2013), Kulnieks (2013), Sillitoe (2000), and Warren et al. (1989) who perceive of IKs as holistic with a profound care for the earth.

According to my respondents indigenous agricultural practices of the Tonga people include among others; non-indiscriminate cutting down of trees, knowledge of trees and their uses, ability to read weather patterns through observing trees, use of medicinal herbs to treat animal diseases and for pest control management. In addition to all this was the informants' understanding of IKs through the rituals of caring and preserving the land for future generations that are conducted at the ancestral rain shrine 'Gonde'⁹ which is the 'mecca' for agricultural activities among the Tonga people.

The lessons conducted at this shrine are aimed at helping people to take communal responsibility for their actions towards the preservation of their agricultural environment. . At the same time IKs if not well handled could contribute to land mismanagement. This is in line with the notion held by Haggblade and Tembo (2003) who argue that not all traditions are good, and that Zambian traditional farmers sometimes use traditional agricultural methods that are detrimental to land conservation.

While the minority of the respondents valued the importance of IKs, the respondents who were more or less interestingly involved in education for example teachers, learners and curriculum specialists were on the whole ambiguous or even negative to IKs. Many of my

⁹ Gonde: literally means thick forest in the Tonga language.

teacher respondents perceived IKs as mostly secretive knowledge held by a few individuals and that the taboos attached to them created suspicion and lack of trust. Moreover, teachers had a stance that seemed to suggest that IKs were associated with primitivity and backwardness. Trained through a Western education system the teachers' attitudes are not unexpectedly influenced by the global architecture of education. Since the teachers are important stakeholders their attitudes have of course implications for curriculum development and for the agricultural science syllabus in particular.

The subsequent sections in this chapter will focus on how the education stakeholders perceive the inclusion of IKs in the teaching of agricultural science in various ways.

5.2 Discourse of the agricultural science syllabus

The teaching of agricultural science is to a large extent based on the curriculum/syllabus and textbooks (in this study text books were not part of the documents analysed).

The Zambian education policy statement, 'Educating our Future' (1996) emphasises the significance of linking the content of the curriculum and the process of teaching and learning to the local environment. It is hoped that through this initiative, the curriculum for secondary school agriculture will have space for indigenous knowledges. However, the findings related to the integration of IKs in the secondary school syllabus specifically that of agricultural science showed that topics hardly indicated elements of IKs (as evidenced in the general aims of the senior syllabus from grades 8-12). Nevertheless, the syllabus has a few scattered sentences where IKs are reflected, particularly in the teachers' notes that give guidelines to the teacher on how to achieve the stated objectives. For example, the topic on "the importance of agriculture in Zambia" in the teachers notes it is stated: "refer to improvements of some of the traditional methods of farming for example ranching, crop rotations, etc." However the general impression of the secondary syllabus was stated by one of the respondent: "If IKs is in our syllabus, then it is hidden and it depends on the teacher because if we look at topics like agro-forestry, bee-keeping, agricultural visits and field trips they are rare" (Teacher, 2013). One teacher further indicated that in the present agriculture science syllabus there was really only one knowledge system in the sense that IKs were not really represented.

The general outline of topics and specific objectives for the junior syllabus (see appendix VI) does not make any explicit mention of IKs and is devoid of any guidelines to teach IKs.

Nonetheless, there are topics within the syllabus that could be taught by integrating IKs. As mentioned in the findings in Chapter 4, the first topic in the junior syllabus on ‘Agriculture in Zambia’ was aimed at giving the learners a background of agriculture in Zambia through a learner centred approach so that the teacher tapped into the learners’ prior knowledge.

However, the outline of sub- themes and specific objectives did not suggest any practical activities for the learners, instead there were more passive verbs like list, state, outline, recall, name, describe, as compared to action verbs where learners acquire hands on skills. For example just to mention a few topics, specific objectives on the topic - Crop Production, had some action verbs like apply, demonstrate, explain, measure, prepare and identify and these were few in comparison with verbs that encouraged learners to construct their own knowledge.

Moreover, the practical lessons, while allowing learners to carry out a project, did not emphasise application in the immediate or home environment. For example the topic on crop production had a sub-theme of weed control where specific objectives stated that learners should explain the importance of weed control and describe methods of weed control; there was no mention of what methods of weed control the learners use at home. The specific objectives made no mention of any indigenous methods of weed control for integration purposes.

The sub-topic on Development of agriculture in Zambia instructed the teacher to discuss agricultural systems in Zambia and their effects on the environment. The teacher’s notes instructed the teacher to refer to small scale farming and commercial farming – their effects on the environment and to approach the topic from a practical point of view. However the practical point of view was not stipulated. Thus both the junior and senior secondary school syllabuses were biased towards Western agriculture knowledge. (For the outline of topics, see appendix.)

This more or less complete lack of IKs in the syllabi implied that it was up to the teacher to decide on what elements of IKs to include, keeping in mind that there are also recommended text books that are in line with the syllabus prescriptions. Moreover, with no training in IKS (due to the Western educational discourse) it is no wonder that teachers were reluctant to include IKs in the teaching of agriculture. On the practical dimension of this syllabus, while it states that the subject should be more practical than theoretical, and not confined to topics covered in the syllabus, the contradiction is easily noticed in the allocation of marks. The

subject allocation of marks in the final examinations at the end of the two year and three year course for juniors and seniors respectively shows twenty percent (20%) for the practical and eighty percent (80%) for the theoretical part (CDC, 2000). This allocation of marks probably guides the teacher on where to spend and allocate more time.

The above observations are in line with what the informants mentioned that the present syllabus had very little of the learners home experiences thereby disconnecting learners from their day-to day activities. In addition the disconnection is amplified because learning is examination oriented therefore sidelining IKs that are not examinable. From these observations, it seems to indicate that the agricultural science syllabuses in secondary schools studied deprived learners of an opportunity to learn and become aware of what exists in their local environment in order to build on and improve the existing skills of farming. This is due to the influence of the global architecture of education which seems to deprive teachers the opportunity to include IKs in the syllabus. In addition, the “global architecture of education alienates students with an alternative epistemological background” (Breidlid, 2013, p. 4). One of the respondents stated: “home for us is very important” (learner, 2013), which is in line with Berger and Luckmann’s view of the primary socialisation that children get from home or their immediate community that would not be completely wiped out by the secondary socialisation they get in later life, for example at school (Berger & Luckmann, 1991).

However, some respondents made it clear that they were not in favour of IKs because Western agricultural knowledge is associated with increased agricultural production, reduced labour and an open global market whereas IKs are known to be labour intensive, slow and of low productivity. The conflict in ideas embedded in the above sentiment seem to be in line with Gyekye’s (1997) argument about the polarising of modernity and tradition as discussed in the theory chapter.

Furthermore, according to the respondents, the casual approach to integrating IKs made the teachers feel that the Zambian education system and policies do not support IKs. As a result learners are continually immersed into the European educational values and world views (Kulnieks et al., 2013) as some of them stated; “IKs are not in our syllabus, they are not taught”(Leaner, 2013).

Moreover from the learner respondents, it was evident that most of the teachers were using English as a medium of instruction as a choice of delivering the lessons. Scholars like Breidlid (2013, p. 60) and Brock-Utne (2000) argue for the centrality of the use of the mother tongue as a medium of instruction, in the process of indigenisation of the curricula and the advantages of being taught in a mother tongue. The curriculum specialist's use of the metaphor of viewing Western knowledge as an 'addiction' to describe Zambia's attitude and affinity to Western knowledge seemed to indicate that while in one breath some of the respondents were bemoaning the marginalisation of IKs, there was no strong will to negotiate the inclusion of the knowledge system within their curriculum or daily teaching. In the degraded state the soils in the province were talked about as indicated in the findings chapter, one of the teachers who are in the minority suggested the need to provide an education that was relevant to the needs of the people through localising the centralised curriculum.

Having discussed the place of IKs in the agricultural science syllabus, the next section will look at the integration of IKs into schools as places where knowledge is transmitted.

5.3 Integration of Indigenous knowledges into schools

The findings of this study revealed that most respondents viewed integration of IKs into agricultural science with scepticism because of the long history of living with Western knowledge. When it came to the integration of IKs into school agricultural science in particular, the findings of the study revealed that the respondents had a clear understanding of which knowledge system was more superior and preferred. It seemed easy for most of the respondents to associate with and talk about Western based agricultural knowledge and its successes. This came from the perspective of Zambia's education system being fully embedded in the global architecture of education with its bias towards Western education. This therefore makes teachers view modern agriculture as passing for modernity as argued in the theory chapter (section 2.3) where conventional agriculture is linked to wealth, prosperity, privilege, and technology etc.

The Zambian government (MOE, 2001, p. 29) still sees school as a major socialising agent in preparing young people for life. In this 21st century where education for sustainable development is emphasised, "appropriate choices for a sustainable future can only be made on the basis of comprehensive knowledges, therefore, school has a role to play in conscientising students as well as teachers" (Breidlid, 2013, p. 197). As earlier discussed, IKs are not

comprehensively included in the syllabus. One of the teachers who represented the minority among the teacher respondents said; “what we need to do is to bring the two knowledges together, they are both rich, let us have it incorporated into our methodologies of teaching” (teacher, 2013). The implication being that in a situation with two knowledge systems coupled with the overarching hegemony of the global architecture of education and misconceived ideas about modernity and tradition, teaching and learning for a sustainable future calls for the transformation of the hegemonic curricula and the conversion of the classroom into a decolonising space. A third space which generates new possibilities and solutions by going above the deep rooted positions of knowledge systems and opening up alternative ways of knowledge production (Breidlid, 2013).

This leads into the next section that looks at what values the schools transmit within this context.

5.3.1 Schools as transmitters of values of modernity and tradition

The study revealed that modernity and tradition had a great influence on the way agriculture was practiced and taught in the classroom. It was noted that the agricultural science in school did not talk about climate change explicitly, although most respondents could link environmental degradation to the so - called ‘civilisation’ and the challenges brought about by modernity. The respondents indicated that the choices of agricultural practices in Zambia were mostly driven by an undercurrent of the Western agricultural practices, which was also influencing the agricultural science syllabus. For example, there was a clear indication among the respondents that “big is better” which implied that mass production was better as it led them closer to the global market and self sufficiency, compared to the traditional methods of farming that produced less and made them dependent. One respondent noted:

Present agriculture is characterised by mass production and that is what we teach, that globalisation¹⁰ has opened the market for us and we are able to produce more and sell to other countries (Teacher, 2013).

This echoes Warren’s (1991) argument as discussed in the theory that knowledge, skills and survival techniques of farmers operating with low levels of modern agricultural inputs has

¹⁰ Globalisation: “a process of interaction and integration among the people, companies and governments of different nations, a process driven by international trade and investment and aided by information technology”(The Levin Institute, 2011, quoted in Breidlid, 2013c, p. 16).

usually been ignored or overtaken by the promotion of Western technological inputs. Although some teachers rejected the idea that they purposefully assimilate Zambian learners into a Western hegemonic world view, the teachers by virtue of the emphasis they place on the Westernised way of teaching agricultural science seem to be working towards assimilating learners into viewing agriculture as a modern construct (see section 2.3).

In line with this, some scholars like (Slikkerveer, Brokensha, Dechering, & Warren, 1995) argue that in this 21st century it has become increasingly rare to find a farming tribe which is completely isolated or cut off from the market economy and from Western cultural influences. However, even with the above in mind, there was an evident conflict of interests in the teachers, learners and the curriculum developers (within this study) in relation to choices of farming methods. They were fully aware of the devastation of land that was pervasive with the conventional farming methods, for example the deforestation of huge pieces of land, use of heavy equipment, inorganic fertilisers and other chemical pest control methods. Yet still the school curriculum as well as the teachers placed more emphasis on conventional farming techniques and the industrialised model of farming. This seemed to echo the colonisation of the African mind which Gyekye (1997) calls the post- colonial African mentality where the choice of Western ideas or ways of doing things is preferred even in view of its negative consequences.

In relation to the local elders as custodians of IKs, however, one respondent observed that though indigenous knowledges were valued knowledges, local custodians of these knowledges were not given a chance to take them into the school. This is because it was considered as unofficial knowledge as these carriers were traditional. As one teacher respondent stated; “local knowledge is not reaching our classrooms, learners from the village may have a chance to have that knowledge but cannot bring it to class because it is not valued” (Teacher, 2013). This has led to a state of affairs where agricultural science as noted is taught as a purely Western academic concept that ignores the cultural context of the learners. This is in line with the theory of the global architecture of education with its Eurocentric epistemology which alienates students with an alternative epistemological background (Bredlid, 2013). Most of the teachers and learners observed that the lack of scientific proof and documentation of IKs was making the teachers present a laboratory based science and technology as undeniable scientific truths dismissing other alternative knowledges as anti-science. Sillitoe (2000) argues against this view of science which fuels the

hegemony of Western science discourse which inherently places IKs in an inferior position by somehow declaring that what cannot be proven is not knowledge. Woodley (as cited in Warren, 1991) in the theory chapter argues that while science is still a dominant paradigm, IKs also contain ideas and practices that might not be part of the formal science but still help in understanding the farmers' perspective.

Moreover, the Eurocentric curriculum's emphasis on rational thinking and empirical scientific proof is typical of the modernisation theory and its dictates in the global architecture of education. As one teacher stated; "What has been proven scientifically is what is considered knowledge so much that traditional knowledge has no space" (teacher, 2013). This matches with the curriculum specialist's view asserted as; "knowledge has to be proven" (curriculum specialist, 2013). These findings imply that the school is still perpetuating the marginalisation or 'Othering' of the local agricultural knowledge due to the influence of conventional agricultural knowledge. From this implication, one could be made to think that because of the influence of Western education, the school system in Zambia has contributed to people seeing whatever is not documented like indigenous knowledges which are passed on orally as not being trustworthy knowledges. As a result, the influence of indigenous knowledges in the education system in Zambia, particularly in the secondary school education level, has not been recognised and appreciated. This is confirmed in the words of this respondent:

To some extent the IKs are not appreciated by some teachers and learners. However, there are very few schools where they appreciate IKs especially in the faith-based organisations (Curriculum specialist, 2013).

The above quote is a typical example of the influence of the hegemony inherent in Western education in Zambia. From that perspective, Ngugi (1986) displays concern about how Western education has colonised the minds of people in the global south. The respondents' views made it evident that there was need to create a culturally sensitive and relevant educational process for the learners. By implication, it meant that in order to bring out the foundations of the past into the present, the cultural core which informs the indigenous agricultural process needed close examination. In addition, the traditional values of the learners, teaching methods and the responsibilities of the learner were all to be considered, of course keeping in mind that not everything in the past is valuable. As Breidlid (2013) suggests that "it is not possible to return the IKs to some pure, pre-colonial existence because all cultures are in a state of change" (p.43).

The curriculum specialist pointed out how some practices like Swidden agriculture have existed for centuries and how IKs can be used to control environmental degradation and promote land sustainability:

Our people have always known conservation farming though they did not call it by that name. While our people did Chitemene (Swidden agriculture¹¹, shifting cultivation) they were aware of the acidity and using their IKs they used ash to get rid of it. That is how they grew their grain and after this, they always planted groundnuts (Curriculum specialist, 2013).

This implies that conservation farming or some form of it was not new to Zambia and had been practiced by Zambian farmers for generations but it seemed the many years of teaching and practising conventional agriculture had led to the loss of the original knowledge. In connection to this, some of the respondents pointed out that degradation of the soil led to reduced yields due the conventional methods of agriculture which did not include IKs. As was pointed by one respondent;

I was not taught this but what I see in my own village that we have huge pieces of land.....used to get high yields and now we are hardly getting anything.....the natural grass that used to grow there is gone, trees are only small shrubs left (Teacher, 2013).

This implies that soil degradation was a real lived experience even for the teachers, but such experience seemed not to be translated into a more varied agricultural teaching in the classroom. The next section discusses the role of teachers in the integration of IKs in the school as their role seems ambiguous with the coming of the ICT.

5.3.2 Roles of teachers

From time in memorial, the Zambian teacher has been assigned the central role of disseminating scientific knowledge in the formal school. The village elder on the other hand has enjoyed a central role of disseminating cultural knowledge in the community. Shizha (2007) argues that there is a false understanding regarding the role of a teacher as the only source of scientific knowledge.

¹¹ Swidden agriculture: a traditional agricultural system practiced by semi-nomadic people in whom a patch of forest land is cleared for cultivation by felling and then burning trees (which adds nutrients to the soil). Crops are grown for 1-5 years before the soil becomes depleted, weeds invade, and yields fall. The site is then abandoned and work commences on another site. Sites are cleared and cultivated in rotation, ideally allowing each one a fallow period long enough for its fertility to recover (Park, 2013, p. 394).

At the dawn of Information Communication Technology (ICT), the findings of the study revealed that lines of information flow are changing (see Breidlid, 2013). I agree with Breidlid when he points out that although there is a digital divide between North and South, people in the South are accessing internet and social media. In addition many learners in Zambian schools now access information from a variety of sources other than the school as noted by one learner who said:

We copy a lot of things from the tourists, we learn modern things and we spend most of our time on television, internet and sports, whatever information we need, it is on the internet (learner, 2013).

One implication of this finding in the school is that teachers are no longer the authority behind learners' access to information because learners can access any information they want from the internet and other information communication technology (ICT). In addition, respondents were also aware that ICT has done away with the differences between place and space, because according to them, they could communicate with any part of the world. However, one wonders, with all the ICT available in the world at the moment, could IKs be passed on to subsequent generations in other ways than orally? The widespread unquestionable acceptance of computers and other ICT seems to reflect the younger generations' embrace of the Western myth that technology and print based technologies are culturally neutral and a sign of progress (Bowers, 1993).

Since IKs are mainly transmitted orally, some of the proponents of IKs, Warren et al., (1989) challenge oral transmission through what is called "hoarding the treasure" (p. 22) meaning that village elders may harbour special talents or agricultural skills and are not willing to share them with the community (See chapter 4) because it provides them with an economic or social advantage within the local community. When this happens, it becomes difficult to share the benefits of such knowledge widely and the act of hoarding actually becomes another way of side-lining IKs. In line with this Gyekye (1997) points out in his theory that tradition cannot just end at simply being handed down presuming it will be accepted because tradition is not static but dynamic and open to change. Since it is 'not paved in stone', it allows the subsequent generations to choose which portions of the tradition are appropriate at a given time. I however concur with Breidlid (2013) in his claim that ICT cannot replace the role of the school. Instead, the school in this era can counteract the top down transmission of the knowledge via ICT which in some way perpetuates the imposition of Western hegemonic

knowledge. He sees the school as a potential decolonising third space for disseminating counter narratives.

The findings imply that even though some teachers realise the importance of IKs, the way the syllabus is made does not encourage them to integrate IKs in the lessons. From these implications, it is possible to think that learners were deprived of their own local knowledge which if used in the classroom teaching would make the students learn and understand better. This is so because teachers, subject specialists, policy makers and other people tasked with the responsibility of improving education in Zambia do not realise the importance of IKs in the teaching and learning process. There is a need, as Shizha (2007) points out in the case of Zimbabwe, to change the attitude of teachers and policy makers towards their perception of this knowledge. Breidlid (2013) concurs with Shizha (2007) when he states that teachers and governments in the global south needed to seriously start incorporating indigenous knowledges in their school curriculum not as a commodity but as a knowledge system.

The next section discusses the place of IKs in agricultural science as knowledge that people have interacted with.

5.3.3 Agricultural Science as business or culture

The importance of pharmaceuticals in relation to IKs is due to the fact that indigenous herbs and seeds have proven useful in various ways. Generally, because the curriculum does not include IKs, the reality on the ground according to the majority of respondents was IKs were being used in real life and yet the syllabus was, as has been noted, silent about it. The importance of indigenous herbal products should have underlined in the school system to conscientise the teachers and the learners. Instead Chinese herbal care products are now flooding the Zambian market. The interest in Chinese herbs was attributed to the desperation and search for healing in the HIV/AIDS patients. This import of foreign products could have been minimised if IKs had not been side-lined as one of them stated:

IKs are not in our syllabus, it is not taught, the knowledge is lacking in our pupils and our pupils do not appreciate it so much. Though now when you look at what is happening with people suffering from HIV/AIDS, people are going back to the traditional medicine. Though sometimes they are deemed to be too traditional and primitive because the concentration of these medicines are not known that is why we need integration so that it is improved on (Teacher, 2013).

The emphasis on conventional agriculture and the side-lining of traditional agriculture was seen by informants as due to increased consumption due to population growth and the need to generate income. Despite land degradation due to modern interventions the short term goals of conventional farming were given priority over more sustainable farming practices. As one respondent noted:

If we talk about IK it is a grey area so to say because we are not only focusing on what used to happen in those days because agricultural production today is linked to sustaining the market out there. We are always thinking very quickly about how to multiply the yields and boost the economy, given a short period of rain and this is how the issues of chemical fertilizers and cross breeding come, so that we can have increased production (Curriculum specialist 2013)

Despite the destruction of the land in the province, farmers thus still chose conventional methods of farming because of the visible and quick benefits attached to it at the expense of traditional methods that have conservation characteristics. This, in the long run, this has resulted in the West's control of the crucial knowledge base that shapes agriculture. In so doing, the extensive diversity of local conditions and indigenous knowledges have been neglected, thus leading to the suppression of potentially more sustainable alternatives (Third World Network (TWN), 2013). While ideally, IKs hinge on preservation of the environment, but yet in the words of the respondent highlighted above, the knowledge seemed to be an impediment to the desired mass production.

Furthermore, the lack of connectedness between the knowledge and the learners' context brings about the challenge of border crossings which is discussed in the next section.

5.4 Border crossing and hybridization

The study has highlighted that IKs have not been properly included in the school system. This has serious implications for the Zambian learners, because there is no link between the home environment and school. Therefore, the learners have to make border crossings. The study revealed that, most of the respondents were aware of the disconnectedness of the agricultural science syllabus to the learners' home environment even when the national curriculum statement stated that the curriculum was localised "to provide an opportunity for a child to be more aware of what existed in his/her environment, to acquire skills existing in the community and see how they could be improved upon" (MOE, 2001, p. 25). However, the respondents were very aware of the exclusion of IKs in the agricultural science syllabus.

Respondents viewed this non-inclusiveness to be the cause of disconnectedness of agriculture with the home environment of the learner. As one teacher during the interview noted:

It carries very little of the children's home experience. Sad though at this time when our whole planet is upset and our land is becoming barer because of facing human destruction. If our children were well taught, they could carry these lessons through life and they would be the advocators of the preservation of the environment. But since our children learn for the exam, and it is very separated from their daily experience, they don't carry anything (Teacher, 2013).

The disconnectedness above was due to the content of the syllabus and the language of instruction. Therefore, in view of the above disconnectedness, these learners according to Fakudze (2003b, quoted in Breidlid 2013, p. 98) find themselves having to cross a cultural border between their home/African worldview and that of the school agricultural science, a concept called border crossing. Breidlid (2013) refers to learners having an epistemological shock because the two settings are completely different in an epistemological sense. From the learners' views, the indication is that these border crossings are not usually smooth. Sometimes these borders are so edgy that they are not easily transitioned. When this fails, they drop out of school or come out of school without having benefited from the experience (Serpell, 2010).

Serpell (2010, p. 14), as noted in the theory chapter, argues for "trans-cultural communication," which in my opinion is a way of bridging the gap between two knowledge systems. Moreover, some scholars (Richards 1996, Goodman and Watts, 1997, quoted in Nederveen Pieterse, 2009, p. 56) argue for the hybridisation of culture where there is co-existence of cultures, also in the agricultural field. Across the globe, there are traces of cultural mixing evidenced in crops planted, planting methods, agricultural techniques, implements and inputs used (seed, fertilizers, irrigation equipment etc).

It is believed that learner participation takes on a new feature in the area of education when IKS are made visible in agricultural science education. It brings students' school experiences closer to their home lives and awards them an opportunity to develop their talents and abilities to their full potential, gain confidence and self-esteem, use their initiative and creativity, acquire life skills and make informed choices, and to understand and experience cultural diversity and co-existence (UNICEF, 2004).

The next section discusses the linking of learning environments as a way contextualizing learning, which is aimed at taking into consideration the learners' context.

5.4.1 *Linking learning environments*

The findings of this study revealed that there was a general awareness that the agricultural science syllabus was disconnected from the learners lived experience and hence the desire though from the minority respondents to localise the curriculum and include indigenous knowledges so as to make the curriculum relevant to the local environment. In line with this, Borland (in Kulnieks et al., 2013, p. 36) argues that agricultural science should have relevance outside the classroom in that what learners learn in school be linked to the world they live in. The mismatch between practice and the syllabus at the schools under study seems to agree with the workings of the modernisation theory where according to Serpell (2010) agricultural science is taught in such a way that it is preoccupied with packaging a certain kind of individual equipped with a coherent package of skills, values, motives etc well adapted to the task of building and maintaining a modern industrialised society.

By implication, it has been observed that the contextualisation of teaching and learning “strengthens the links between the three learning environments (school, home and community) and can be achieved by building on learners experiences from outside school and providing additional experience within the school programme” (Taylor & Mulhall, 2001, p. 145). Below is an illustration that represents the link between school, home and community.

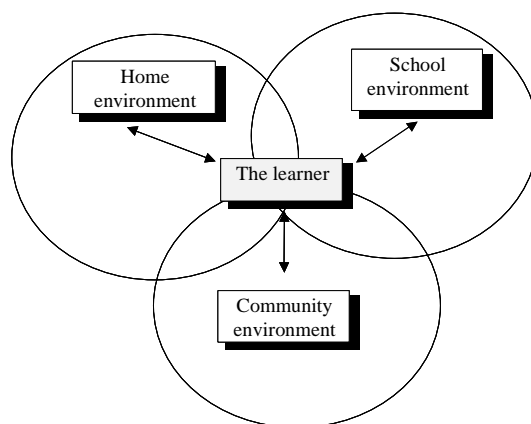


Figure 1: Linking the learning environments (Taylor and Mulhall, 2001)

The illustration above is in line with the *Zambian teachers curriculum manual* (MOE, 2001) which states that “parents pupils and the local community in general shall feel that formal education is strongly linked to their day to day life” (p.25). A break in these links by implication means that the opposite is happening. According to the respondents’ views, learning is viewed as a communal endeavour where parents aspire for their offspring to put back and add value to the community. This notion is supported by Merriam and Kim (2008) who state that “from the communal perspective, learning, among most indigenous communities is the responsibility of all members of the community because it is through this learning that the community itself can develop” (p.73). When education falls short of this element, schooling becomes a waste of time. This matches with Serpell’s (2010) findings in the Eastern province of Zambia arguing that parents in the end did not see the need to send their children to school. This communal aspect however is at odds with the modernisation theory whose emphasis undermines traditional values of collectivism and favours individual progress.

Having analysed the findings of the study, the next chapter will conclude the study.

6 Conclusion

This chapter brings this thesis to an end by highlighting issues that stood out during the exploration of the topic under study. The main purpose of this thesis is to explore the integration of IKs in the teaching of agricultural science in Secondary schools in Zambia, looking specifically at the interaction between IKs, agriculture and Western knowledge. Since the bedrock of this thesis is the integration of indigenous knowledges into the teaching of agricultural science, the final section of this thesis will discuss challenges of integrating IKs into the teaching of agricultural science as pointed out by the respondents in this study.

6.1 Challenges of integrating IKs into agricultural science teaching

This study revealed that much work needs to be done in order to integrate IKs into the teaching of agricultural science in Zambia, given the importance and publicity bestowed on IKs and indigenous ecological knowledge in the present era.

The findings in this study revealed that all the respondents had a basic understanding of IKs, however as completely separate from the acceptable knowledge which in my view is problematic when it comes to successful integration of the IKs in agriculture science. For example, since indigenous and Western knowledges were clearly set as two parallel paradigms, integrating the IKs paradigm into the knowledge that is perceived as superior becomes challenging because IKs are seen to be archaic and backward. While the Education Policy (MOE, 1996) clearly stipulates that the curriculum in secondary schools be brought close to the needs of the community, the rhetoric and the practice do not match because IKs have not been explicitly integrated in the school agriculture syllabus. This has led to a situation where IKs are completely left out in the teaching of agricultural science instead promoting teaching Western agricultural based knowledge thereby reinforcing the existing dichotomy between two knowledge systems. The responses from the respondents as well as from scholars like Warren et al.,(1989) point out that separation of modern agriculture and technology from modern indigenous tradition is “reinforced in African schools not only through exclusion of IKs but by teaching agricultural science using a foreign language”(p. 63).

The following are some of the envisaged and experienced challenges of integrating IKs in the teaching of agricultural science. Each challenge will be addressed separately.

6.1.1 Home school relationship

Lack of connection between home and school as already discussed in section 5.5 was mentioned by respondents as a challenge. To illustrate this, the learners in the city school cited how the tourists and life in the city had influenced them as one of them stated. “Home is a very important school for us but our parents have not taken responsibility towards local knowledge, we just see things from our friends in the Western world on the internet and other technology” (Learner, 2013). The learners seemed to imply that if their parents took an active role in educating their children about IKs, the learners would have probably been more enlightened. This seems to be in tandem with the argument under modernity and tradition as shown in the theory chapter where it is postulated that in this digital age, teaching of agricultural science cannot only rely on teaching traditional knowledge of farming and sustainability just within the limits of the local environment, but instead, teachers need introduce learners to cultural forces that are promoting technological and economic globalisation (Kulnieks et al., 2013). To this effect, Gyekye adds; “tradition that does not accommodate itself to changed circumstances will subsequently fade” (1997, p.242).

By implication, when learners move from their home culture into the formal school culture, especially for rural learners, the disparity between home agricultural practices and school culture can be so great that they experience a culture and epistemological shock (see section 5.5.1). This shock has the potential to significantly affect their attitudes towards school because their own context is ignored and often rubbished (Breidlid, 2013; Warren, 1991). This is in line with Serpell’s view where he views formal schooling as an alien tradition that is supposed to change how learners think, but “if schooling is to be a source of empowering enlightenment, its intellectual content must recruit the imagination of a growing child” (Serpell, 2003, p.4), otherwise learning becomes a futile effort.

6.1.2 Examinations pressure

The government policy on centralised examinations was also cited by the respondents as one factor that negatively influences integration of IKs into agricultural science teaching. Their arguments being that IKs are not explicitly included in the syllabus. Meanwhile, the teacher has to prepare the learners to sit for a centralised examination at the same time with everybody else, since it is not a must that they integrate IKs. With this attitude, teachers seem to imply that their worth was dependent or measured on the kind of academic results or grades

they produce. This is in line with what has already been discussed in section 5.6.4 where teachers felt that they owed it to the parents to produce good grades. This kind of learning seems to encourage what Freire (1993) calls 'banking education' which seems pervasive in the education systems in the global South.

6.1.3 *Teacher and student attitudes*

Some teachers in the study were not confident about IKs and hence underrated the effectiveness of the knowledge compared to scientifically proven knowledge, hence failing to see its value. Lack of interest in the subject by learners was attributed to the wholesale prescription of agricultural science in the government town school where for some learners it was not a subject of their choice. However, the lack of interest in some learners stemmed from the stigma attached to the subject, in that it was perceived that agriculture as a subject was manual work or cheap labour for the school, therefore relegated to those who are not competent in natural sciences. The learners also confirmed that since the subject had to do with farming, it was traditional and therefore somehow primitive compared to other subjects like Commerce or Principles of Accounts or Computer technology which were more academic and trendy. This seems characteristic of living with the polarities of modernity and tradition and how the perception of either concept affects the choices the learners make as established in the theory. Gyekye (1997) argues against the polarity and that it is premised on false grounds and that modernity has elements of tradition and vice versa.

6.1.4 *Resources –text books*

In my observation, the textbooks alienated both the learner and the teacher from the process of knowledge acquisition but whether the teachers even noticed or knew this, remains to be established. However, I observed that all the teachers used text books and relied so much on text book knowledge, which they constantly referred to, as if knowledge contained in those books was undisputed facts and absolute truths. The Western interpretations of agricultural science seemed to be oppressing learners whose non-Western background was already a cultural barrier. This is on the understanding that most text books found in Zambian secondary schools are believed to contain knowledge constructed and written by the people from the West who are likely to have misinterpreted and misrepresented the facts and truths about Agriculture since they are not native Africans. Undoubtedly, the focus on documented information and what has already been prescribed as scientific knowledge has led teachers to

just guide the learners towards that prescribed and documented knowledge which the teacher perceives to be relevant knowledge. In a situation like Zambia, where IKs are less documented in the books, it implies that IKs can easily become forgotten knowledges. Shizha (2007) argues that text books are a hindrance to the integration of IKs in agriculture science teaching because they are viewed as ‘facts’ and ‘truths’ documents.

These implications are in line with how the teacher respondents expressed their need of text books. As one of them said; “To avoid teaching wrong information, we use text books especially when we are not sure about the topic. The text book keeps me on track” (teacher, 2013) which was also supported by another teacher who said; “a text book acts as a guide so that I make sure that I cover all the necessary and important topics” (teacher, 2013). The teachers seemed to be saying that they were comfortable and confident when they had a text book. This may mean that the text books do not allow teachers to look at knowledge outside the textbook. A further implication is that the text book silences the learners’ agency and it treats them as people who are incapable of initiating and constructing knowledge. Moreover, this situation can lead to the break in school and home linkage that has already been discussed in the previous sections (5.5.1 and 5.5.2) in that learner stories and experiences that they bring from home get lost and taken over by an urgent need by the teachers to fulfil syllabus requirements and prepare learners for final examinations. This is characteristic of what Breidlid (2013) warns about in that most of the knowledge in the text books in the south is decontextualised and therefore, there is a need to provide a contextualised framework to understand and critically evaluate the knowledge.

6.1.5 *Teacher training*

The findings in this study revealed that the methods engaged and attitudes teachers bring to the teaching of agricultural science in the classroom derive largely from their teacher training colleges. With the general understanding that was inherent in all the findings that IKs were not integrated in agricultural science teaching, the teachers in this study partly attributed the inability of integrating IKs in their teaching of agricultural science to their training. They seemed to imply that their teacher preparation and other courses taken in the years of study did not incorporate IKs in the college agricultural science curriculum and teaching practices. This was as a result of the design of the curriculum which did not take into account the complexity of an inclusive curriculum and prepare teachers for its implementation. Shizha (2007, p. 315) affirms this when he points out that “to deny cultural fusion in the teacher

education programme denies teachers the skills and techniques for successfully incorporating IKS in the formal curriculum. One of the teachers confirmed this as he said;

as teachers we are not equally taught about IKS, I remember my own Zoology lecturer bringing it to our awareness that there is a lot in the IKS that is valuable but not documented and so it makes us stuck on how to strike a balance, because it is not because it is not given space, it is just shoved aside and forgotten (teacher, 2013).

This is in line with Wright and Abdi (2012) who state that teachers and other education actors need to transform individual perceptions of what makes up legitimate and valuable school knowledge, only then can effective integration of IKS into the curriculum content succeed. Since teachers are involved with the implementation of the curriculum, they need to examine their teaching practice and where possible develop ways to authentically engage and legitimise IKS into the formal education system.

6.1.6 Limited research on IKS in Agriculture science

Lack of well founded research in the area of indigenous knowledges in agriculture on the Zambian academia, was pointed out by the respondents as a major challenge in coming up with the knowledge of how to integrate the two knowledge systems. The respondents expressed that since the IKS field has not been interrogated, the implication was that there was no authenticated documentation of the knowledge, which according to them meant not validated knowledge. This seemed to suggest that among Zambians, it is a common notion that validated knowledge is found in books. As a result of this, the curriculum specialist felt that it becomes difficult for the teachers to teach assumptions. She said; “there is a poor link between agricultural research and agricultural science teaching, for the people to appreciate it, let there be well founded research in this area and this will convince people”(curriculum specialist, 2013). These findings seemed to mean that for IKS to be integrated in agricultural science teaching there has to be literature produced on the type of knowledge and research to back up the knowledge claims. A further implication is that government policies play a significant role in the authentication of research knowledge.

6.1.7 Government policy on funding agricultural science

The study findings revealed that the Zambian government does not support IKS through its policies. The respondents cited poor funding as one major factor that hindered the teaching of

agriculture science using practical activities that were inclusive of IKs. For example, the agricultural science teachers in the secondary schools particularly pointed out that subjects like Mathematics and Science were well funded compared to agricultural science. They felt that the two favoured subjects were considered by government as foundations for technology unlike agriculture science and yet, it is one subject that could contribute to appropriate technology considering that IKs is hinged on the preservation of the environment. This for the teachers seemed to give an impression that the subject was not valued and in the long run, creating an ‘I don’t care’ type of attitude in the teachers. A further implication for the teachers was that this negative attitude did not compel them to integrate IKs in their teaching and learning, leading them to mostly maintain the status quo by teaching just what the syllabus prescribed (MOE, 2001). They also pointed out that while they were aware that agriculture was supposed to be taught in a practical way but with inadequate funding they could not access inputs like seed, chemicals, equipment to enable them do practical lessons, but that is a problem for modern agriculture. With IKs these chemicals, equipment etc are not necessary. They seemed to be implying that lack of facilities or infrastructure in most schools has led to teaching agricultural science in the abstract, using chalk and board which ultimately, creates misgivings about agriculture being taught in a theorised way.

6.2 The colonising of the mind

However, in as much as the government has not played its role to encourage the integration of IKs into the teaching and learning of agricultural science, respondent data suggests that Zambians seem to enjoy the cosiness of a long history of familiarisation with the Western knowledge as a legacy of colonisation and also the unconscious “colonisation of the mind” (Ngũgĩ, 1986) that most Zambians have fallen prey to. The misconception of modernity and tradition with modernity perceived as Westernisation. This has gone to the level that the colonised does not even realise but thinks it is normal (Freire, 1993) which I also discuss in section 5.5. The curriculum specialist referred to this when he said; “we need to change our mindset, so that we get interested in our local products, it seems as Zambians we are not proud of our local products” (Curriculum specialist, 2013).

I argue that as long as the Zambian farmers and teachers do not acknowledge the value of IKs and take practical, visible and definite steps to implement it in their agricultural and

educational systems, IKs will remain buried and just be an issue that does not go beyond rhetoric while the various actors in the agricultural and educational sector will continue playing the ‘blame game.’ There is great need to “decolonise the mind” (Ngugi, 1986) because in my opinion, the responsibility of bringing about environmental change lies within the people of the Southern province and the rest of the Zambians. It is this responsibility that would lead the Zambian ministry of education to take on the task of offering the Zambian learner a holistic – non fragmented curriculum that reflects them and their IKs.

6.3 Epigraph

In this age of environmental degradation, the soils in the Southern province of Zambia have lost their ability to support crop production. This was pointed out by various respondents in the study and also confirmed by agricultural conservationists like Haggblade and Tembo’s (2004) research on conservation farming in Zambia.

While I am aware that issues of integration of IKs into the Zambian education system are quite challenging and have mostly just been ending in rhetoric, I like to recommend a reconsideration of the agricultural shrine “Gonde” in Chief Moonze’s area. My wish is that a longitudinal study could be carried out on this shrine to establish what was in it that helped people to take care of their environment. Moreover, it would be important to know what made the Tonga indigenous farmer produce healthy crops and preserve the environment unlike the degradation being presently experienced. The question is, if the real life lessons learnt at Gonde could be integrated into the school curriculum to inculcate a lasting sense of responsibility towards preservation of the environment.

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Appendices

Appendix I. Interview guide for teachers

Background questions for teachers and learners:

1. Name:
2. Age:
3. Educational level/grade for learners:
4. Occupation:
5. Tribe:
6. Position of responsibility in school or government:

Interview guide for teachers

1. How do you understand indigenous knowledge
2. To what extent is indigenous knowledge integrated in the agricultural science syllabus
3. In view of the ecological crisis affecting the whole planet at the moment what do you think is the place of Iks in the teaching of agric science
4. How do pupils take the indigenous knowledge dimension? Do they appreciate it? What makes you say that?
5. Why do you think indigenous knowledge is/is not part of the present agricultural science syllabus? (Is it worth teaching?)
6. How do you look at Indigenous knowledge in the life of a modern Zambian?
7. What difficulties if any, do you face teaching the indigenous knowledge dimension?
8. Do you have any suggestions on how the indigenous knowledge content in the Agric science syllabus can be improved, if at all?
9. What elements of indigenous ecological knowledge could be incorporated in Agricultural Science teaching?

10. In your experience, what methodologies are most effective in teaching the indigenous knowledge dimension?
11. Is there anything else you would like to say about Agricultural Science in general and Indigenous Knowledge in Particular?

Appendix II. Interview guide for learners

1. What is your understanding of indigenous knowledges?
2. What part of the Agricultural science syllabus do you like most/appreciate? Why
3. How do you see indigenous knowledge in the syllabus? Do you learn it? Why
4. What difficulties, if any do you face learning indigenous knowledge in Agricultural science?
5. Are you happy with the way you are taught indigenous knowledge in agricultural science? If not how would you like it to be taught?
6. Is there anything else you would like to say about Agricultural science in general and Indigenous Knowledge in particular

Appendix III. Interview guide for the subject specialists–Curriculum Development Centre (CDC)*Background questions:*

1. Name:
2. Age:
3. Educational level:
4. Occupation:
5. What are your views about the agricultural science syllabus, keeping in mind the ecological crisis that is affecting the planet at the moment?
6. Do you see any link between agricultural science and the care of the earth?
7. How does indigenous knowledge feature in this syllabus
8. Are you aware that indigenous knowledge is not appreciated by some teachers and pupils?
9. What is your reaction? Why is it so?
10. What should be done to remedy the situation?
11. Any attempt to incorporate indigenous knowledge in the syllabus?
12. Is there anything you would like to say about agricultural science in general and indigenous knowledge in particular?

Appendix IV. Interview guide for the Agricultural Extension Officer at Kasisi Agricultural Training Centre (KATC).

Background questions:

- Name
- Age
- Educational level
- Occupation
- Tell me about the history of KATC and how long you have been working here

Interview into the subject matter:

1. Being an institute promoting sustainable agriculture, what type of sustainable agricultural knowledge are you promoting?
2. What is your understanding of indigenous knowledges?
3. What methods do you use to pass on this knowledge
4. In view of the ecological crisis affecting the whole planet at the moment, what do you think is the place of indigenous knowledges in the teaching of sustainable agriculture? Why?
5. What is the place of indigenous knowledges in this programme? Why
6. What elements of your programme do you think could be incorporated in the school agricultural science syllabus? Why?
7. What do you see as the link between the ecological crisis and agriculture?
8. Is there anything you would like to say about agricultural science in general and indigenous knowledges in particular?

Appendix V. Village elder*Background questions:*

- Name
- Age
- Educational level
- Occupation
- Tribe
- Tell me about how long you have been a farmer and what are some of your key concerns with regards farming at the moment?

Interview for the subject matter:

1. In your wisdom as village elder, what is your understanding of indigenous knowledges?
2. In view of the ecological crisis that is affecting our planet and our country in particular,
3. What is the place of indigenous knowledges?
4. What has changed in the farming methods? Why?
5. What is your view of land and how do you care for it?
6. What parts of indigenous knowledges do you think should be incorporated into the school agricultural science syllabus? Why?
7. Is there anything you would like to say about agricultural science in general indigenous knowledges in particular?

Appendix VI Outline of the Junior Secondary school agricultural science syllabus.*Unit 1: Agriculture in Zambia*

- History of agriculture in Zambia
- Main agriculture areas in Zambia
- Crops in Zambia
- Livestock in Zambia
- Industries that support agriculture in Zambia
- Agricultural exports of Zambia
- Land tenure systems of Zambia
- Distributors of inputs in Zambia
- Cooperative societies
- Buyers of agricultural produce in Zambia
- Loans and repayment systems

Unit 2: Soil Management

- Soil formation and composition
- soil profile
- soil types and characteristics
- Soil air and Water
- Soil organisms and humus
- Soil acidity and how to correct it
- Soil nutrients
- Fertilizers and manures
- Soil erosion and conservation

Unit 3: Farm Implements

- Use of hand tools
- Care of hand tools
- Repair of hand tools

- Ox-drawn implements
- Power implements
- Concrete mixing
- Brick making

Unit 4: Farm Management

- Introduction to farm management
- Concept of production
- Farm resources and enterprises
- Choice of enterprise
- Enterprise costs and overhead expenses
- Direct enterprise costs, output and gross margins
- Tractor and oxen expenses
- Budgeting

Unit 5: Crop Production [I]

Vegetable Production

Three vegetables should be studied from the following:

- Tomatoes or Irish potatoes, Rape or Chaumolier or Cabbage or Onion
- Beans or Peas

Crop Production [II]

- The following three crops should be studied:
- Maize and any

- One of Groundnuts, Rice, Cassava, Sweet potatoes, Sorghum.
- Any one of the following:
- Tobacco, Cotton, Sunflower, Sugarcane and wheat.

Crop Production [III]

Fruit Production

- ONE fruit crop should be studied in detail from the following list:-
- Bananas, Citrus, Guavas, Pineapples, Mangoes, Pawpaw

Unit 6: Livestock Production [I]

- Two types of poultry should be studied from the following list:-
- Broiler Chickens
- Layer chickens
- Ducks
- At least one type of animals' studies should be kept in the school
- *Farm Animals*
- CATTLE and ONE animal should be studied from the following list:-
- Pigs
- Rabbits
- Goats

Livestock Production [II]

At least one of the animals studied should be kept in the school

Appendix VII. Outline of the Senior Secondary school agricultural science syllabus.*UNIT 1**AGRICULTURE IN ZAMBIA*

- Importance of Agriculture
- Development of Agriculture
- Environmental influences

*UNIT 2**SOIL SCIENCE*

- Types of rocks and minerals
- Soil formation
- Soil maps and land use
- Soil profiles and classifications
- Composition and properties of soil
- Soil and water
- Soil fertility

*UNIT 3**CROP PRODUCTION*

- External and internal morphology
- Distribution of crops
- Seed bed preparation and sowing
- Crop management
- Plant breeding
- Crop rotation
- Agro-forestry
- Irrigation

*UNIT 4**FORESTRY*

- Role of trees
- Deforestation
- Propagation and management of trees

*UNIT 5**LIVESTOCK*

- Importance of livestock
- Anatomy and physiology
- Breeds and breeding principles
- Livestock production
- Fish farming
- Bee farming

*UNIT 6**FARM STRUCTURES*

- Farm buildings
- Fencing
- Farm water supplies

*UNIT 7**FARM MACHINERY*

- Farm tools
- Machinery
- Mechanics and its application to farm machinery.

*UNIT 8**AGRICULTURAL ECONOMICS*

- Factors of production

- Marketing and agricultural products
- Cooperatives
- Budgeting
- Costing and accounting
- Farm valuations
- Insurance