

Literature reveals that no country is sustainable or has come close to becoming sustainable (Adams, 2003; Chambers and Conway, 1992; Marten, 2001; Moran, 2006; Silver and DeFries, 1991). In a sustainable society, nature is not subject to systematically increasing:

- concentrations of substances extracted from the Earth's crust;
- concentrations of substances produced by society;
- degradation by physical means and, in that society; and
- the ability for humans to meet their needs is not systematically undermined.

There is no proven recipe for success. This has led to the realization that sustainability is essentially an *ongoing learning by doing process* that actively involves stakeholders, in creating their vision, acting and reviewing changes. This has had the effect of broadening the scope of Environmental Education, beyond the limits of the school walls and away from an orientation to learning key content. It has created a support for education techniques such as facilitation, mentoring and action learning which enable people to reflect and learn from their experiences.

There is need to tackle the underlying problems rather than addressing symptoms of environmental degradation. It has been suggested that environmentalism in the past has mostly been a movement against certain things (for example stopping pollution and other harmful activities and complying with environmental regulations), whereas the 'new' environmental stance is more forward thinking. It aims to do things differently in the first place to avoid environmental and socio-economic problems, rather than being reactive and acting on the symptoms instead of the underlying problems. This perspective supports the type of environmental adult education practice which develops skills to tackle the root causes of environmental problems and to *focus on creating a better future*.

Most obvious, there is a task of teaching about the environment and its present vulnerability: of passing on the skills, knowledge and attitudes needed if we are to take care of the natural world which provides life. Similarly, we can carry out our adult education for the environment, helping people gain the competences and knowledge needed to take action. And we can educate ourselves and others through the environment,

learning about the natural world through a direct engagement with it. These are all important tasks, and can best be achieved through dialogue education. Workers, managers, foresters, farmers and fishermen will all need to acquire new knowledge, skills and attitudes if, for instance, agriculture and industries are to function in more sustainable ways in the future. In some cases it may be that we will have to relearn old skills, of course. And with rapid change in industry, agriculture and all other sectors of economic activity, it is unlikely that initial skills training and knowledge will suffice. Environmental adult education is as many-sided as the range of activities needed for environmental protection and improvement. These activities can most effectively be coordinated using dialogue education.

*The use of dialogue is advantageous because it is free, social, inclusive, participatory, normative, on-going, transformative and best of all anticipatory. That is, it implies taking responsibility for one's ability to influence and in some cases, determine the future. Dialogue is transformative because it enables the learners to construct knowledge by themselves, transform social relations in the learning situation such as classroom, and raise awareness. It generates reflections. When people engage in dialogue, they reflect, concentrate, consider alternatives, listen closely, give careful attention to definitions and meanings, recognize options and perform serious mental activities more than they would have engaged in otherwise, because true dialogue cannot exist unless the dialoguers engage in critical thinking. Freire (1973) adds that since liberating action is dialogical in nature, dialogue cannot be *a posteriori* to the action but concomitant to it. Indeed, dialogue creates the potential for human beings to reclaim and shape the world. Most important, dialogue promotes self-awareness, self-reflection and self-criticism.*

Specifically, dialogue empowers learners because the teaching of inquiry skills can bring about individual self-awareness or empowerment, and empowered individuals can in turn confront oppressive social structures as catalysts for wider change. When people engage in dialogue in a learning situation, they participate actively in the learning process, and a democratic process develops because dialogue is the foundation of a true democracy.

By providing a challenging and engaging learning environment through dialogue, learners are able to learn from one another – there is cross-pollination of ideas. Accordingly, they trust, respect and care for each other. As Vella (2004: 25) puts it, “Dialogue helps students and teachers relate on a more personal, trusting level and makes the classroom a more humane place in which to learn.” She concludes that students should be active subjects in their own learning, instead of passive objects waiting to be filled with facts and figures by the teacher.

Some of the ways of initiating a class or group dialogue is by codification and conscientization, that is, problematizing everyday life and learning to perceive social, political, and economic contradictions, and taking action against the oppressive elements of reality. Codification means representation of an ordinary piece of reality. This means knowledge drawn from lived experiences or basing content on knowledge that students bring to the learning situation. It implies proceeding from the known to the unknown, connecting classroom activities and exercises to student’s prior experiences. In codification, the facts presented in real life or concrete context are critically analyzed. In environmental adult education, codification may take the form of a photograph, a videotape, an article or a sketch that represents a real existent or an existent constructed by the learner.

In southern Africa, a number of organizations have been making efforts to promote, create, and contribute to quality environmental education practices and awareness to enhance protection, conservation and sustainable use. One such organization is the Environmental Education Association of Southern Africa which was established in Treverton, South Africa in 1982 (Chipili, 2006). The organization organizes annual conferences which allow environmentalists from different countries in southern Africa, including Zambia, to show case their work, network, and share experiences with colleagues from the region and beyond. Such actions provide opportunities for environmental education practitioners to dialogue in sustainable environment management.

Likando (2005), noted that in Zambia, one good example of awareness rallying in favour of the environment, was noticed among the judiciary staff and captured and reported in a daily newspaper during the official opening of a two-day environmental law workshop for judges by the Chief Justice. Mr Sakala was quoted saying that “issues of safeguarding the environment had become not only of national but international importance and that this called for enlightening people on the dangers of activities that tend to degrade the environment” (Likando, 2005: 3).

Furthermore, the late Republican President, Levy Mwanawasa, State Counsel launched the “Make Zambia Clean and Healthy Campaign” (MZCHC) on 15th June 2007 to promote environmental awareness among the citizens of the country. A few years earlier, to address environmental problems identified in the country, the Environmental Support Programme (ESP) was developed under the Ministry of Environment and Natural Resources and had been under implementation from 1997 to 2003. The ESP components were:

- Institutional Strengthening and Legal Framework;
- Environmental Education and Public Awareness (EEPA);
- Environmental Information Network and Monitoring System (EINMS); and
- Pilot Environmental Fund (for community environmental projects).

There is also the UNDP supported Community Based Natural Resources Management Programme (CBNRMP) under the Ministry of Tourism, Environment and Natural Resources. These measures are complemented by a number of policies, pieces of legislation and actions across sectors. In 2007, Zambia launched the first National Policy on Environment produced by the Environmental Council of Zambia after consultations with various stakeholders. These reforms are aimed at encouraging the various innovative collaborative partnerships between key players in the environmental field, such as various Ministries with environmental interests within their areas of jurisdiction, non-governmental organizations, community-based organizations and donor agencies of various countries.

Environmental sustainability is everyone’s responsibility. In support of this notion, Kelly (1999), alluded to the fact that education has a vital role to play in helping human beings to improve their relationship with the environment and indeed, in contributing to the ultimate sustainability of the planet.

2.2.2 Status of Environmental Sustainability in Zambia

Zambia covers a total land area of 752,612 km² (Davies, 1971) and is administratively divided into nine provinces namely, Central, Copperbelt, Lusaka, Western, Luapula, Northern, North-western, Eastern and Southern. The provinces are further divided into districts. All in all, the whole country has seventy-two districts. The country is situated on the great plateau of Central Africa averaging 1,300 metres above sea level. Zambia is a land of spellbinding natural scenery which needs to be sustained.

The basic principle of sustainable development calls for the sustainable use of environmental resources so that the next generations are guaranteed the same opportunities as preceding generations. MDG number seven is about ensuring environmental sustainability and according to a United Nations Development Plan (UNDP) report on the status of the environment (2007), Zambia’s forests continue to be under tremendous pressure as a result of a variety of reasons with wood harvesting for fuel wood (mainly charcoal and firewood) and timber, and clearance for agriculture and human settlement being the primary ones. The 2007 MDG Progress Report states that Zambia is on track to achieving all the MDGs, except for environmental sustainability and maternal mortality.

2.2.3 Zambia’s Environmental Problems

The main environmental problems that affect Zambia today, according to Environmental Council of Zambia (ECZ) (2001), include the following:

Deforestation

Due to poverty the majority of people depend on forests for survival. The illegal production of charcoal for sale as domestic fuel and the subsistence shifting cultivation results in the clearing of huge tracts of land annually (Ibid).

Wildlife depletion

Depletion of wildlife in Zambia is a serious problem which is caused by illegal hunting, over exploitation and destruction of habitats (Ibid).

Land degradation

The problem of land degradation in Zambia has been caused by a combination of natural, environmental, social economic, land tenure as well as institutional, policy and legal factors (Ibid).

Air pollution

The increasing use of biomass energy increases the emission of carbon into the atmosphere. Dust and sulphur dioxide emissions from mining operations also exacerbates the problem of air pollution (Ibid).

Water pollution and inadequate sanitation

Water pollution in Zambia is mainly caused by mining, agricultural and manufacturing activities. Similarly, ground water pollution is due to leachate from agricultural, domestic and industrial activities, especially mining. Also the increase in population in urban areas increases the rate at which waste matter is generated, but without corresponding sanitary facilities (Ibid).

Among factors that have contributed to bringing about this state of affairs is limited knowledge and understanding of the importance of environmental conservation and sustainable use of natural resources. The situation has been compounded by severe poverty levels which have afflicted the larger majority of the country's population (ECZ, 2001 and Namafe, 2006).

Zambia falls within the subtropical region of southern Africa and is rich in flora and fauna. Its vegetation is mainly made up of savannah woodlands and grassland. It has a tropical climate with three distinct seasons, the cool and dry season, the hot and dry season and the hot and wet season. The country has abundant natural resources. It has five main rivers namely, Zambezi, Kafue, Luangwa, Luapula and Chambeshi. In addition, the country also has major lakes such as Tanganyika, Mweru, Mweru Wa Ntipa, Bangweulu and the human-made lakes Kariba and Itzhi Tezhi. Other interesting features include the Victoria Falls, one of the Seven Wonders of the World. It is also endowed

with various minerals and precious stones including copper, emeralds, zinc, lead and cobalt (Davies, 1971).

The total area of indigenous forest in Zambia is 44.6 million hectares and covers 60 per cent of the total land area, out of which 9.6 per cent are, gazetted forests (Shakacite, 2000). There are 481 Protected Forest Areas; 181 National Forests and 300 Local Forest Reserves in Zambia. These forests have 5,500 plant species (ECZ, 2001). The country boasts of having some of the most sought-after tree species in the world. The Zambezi Teak or Mukusi (*Baikiaea plurijuga*), a tree endemic only on the sandy western parts of Zambia and a bit across the Zambezi River in Zimbabwe, Namibia and Botswana, provides one of the hardest and most durable wood in the world today. Other valuable species that are found in the country are

- *Mulombe* (Mukwa, Kiaat, Mulombwa) or *Pterocarpus angolensis*, which is most abundant in Eastern Province especially in Petauke district and parts of Western Province;
- *Mwande* (Mupapa, African mahogany) or *Afzelia quanzensis*; and
- *Muzauli* (Rosewood) or *Guirbortia coleosperma* (Shakacite, 2000).

All over the country, some other less expensive but equally useful species of timber trees exist.

Zambia is also home to world-class game reserves, lush floodplains, verdant woodlands and a number of natural sources of water including waterfalls. Almost 30 per cent of the country is under game management. The country has 19 national parks and 34 game management areas, run by the Zambia Wildlife Authority (ZAWA). The most frequented parks in Zambia are the North and South Luangwa National Parks, the Lower Zambezi National Park and the Kafue National Park. The Kafue National Park is one of the oldest wildlife reserves in Zambia and one of the largest in Africa. A profusion of wildlife including elephant, lion, leopard, cheetah, hyena, buffalo, roan, sable and a wide variety of other antelope can be sighted regularly. Bird life is extensive and rich in variety (Shakacite, 2000 and ECZ, 2001).

The Luangwa Valley is named after the Luangwa River which flows from Tanzania into Zambia where it joins the Zambezi. The valley is home to the North and South Luangwa National Parks. With a combined area of 20 000 sq kms, the two parks encompass a raw wilderness of abundance and diversity. The valley is home to over 50 mammal species; predators are common; buffalo and elephants abundant and hippo choke the river in vast numbers. Over 700 bird species have been recorded in the country (ECZ, 2001). Up until the 1970s Zambia was considered to have had some of the highest game populations in Africa. This safari destination has been recovering steadily over the last few years with fresh Government controls over hunting and poaching.

About 60 per cent of Zambia's land is under forest cover and the forest provides a wide range of both wood and non-wood forest products utilized by the local and urban communities. As already alluded to above, forests are one of the most important natural resources of Zambia. They play a vital role in people's livelihoods in Zambia. They are major sources of traditional medicine, wood fuel, food, building materials and play major roles in both the carbon and hydrological cycles. Forests in Zambia are important in supporting life especially in low-income communities both in urban and rural areas. A variety of wood and non-wood forest products are utilized by industries, rural households and urban households in various parts of the country.

Current unsustainable levels of utilization have led to great losses of forest cover, which rose to as high as 850,000 ha/annum between the years 1990 to 2000 (ECZ, 2001 and Food and Agriculture Organization (FAO), 2001). Some initiatives are being put in place to check the long term cover losses and degradation. However, today the forests in the country have been made vulnerable to both human and natural induced disasters. The rate at which forest cover is being lost has increasingly become high such that if this trend is left unchecked time may trigger the complete loss of biodiversity embodied in the Zambian forests. Perhaps the highest loss of forest cover was from 1990 to 2000 with a significant decline of 851,000 ha forest loss per year (FAO, 2001). Deforestation as a result of land use change towards agriculture, illegal settlements and Current unsustainable levels of utilization, to mention but a few have contributed to the loss of forest cover in Zambia and Southern Africa as a whole. The critical question seeking

urgent redress is “Why forests in Zambia are being destroyed more and more?” This is a worrying situation as environmental sustainability is intricately intertwined with national development. *Trees give a lot of benefits to the population world-over.*

The hope of alleviating poverty lies in putting in place measures for sustainable use and management of the natural resource base upon which the people derive their livelihood. While acknowledging the importance that biological resources play in the sustenance of livelihoods for the majority of the population in Zambia, the alarming rate at which these resources are being exploited is a source of great concern to the Zambian government and other concerned authorities like chiefs, headmen, and environmental adult educators. The over exploitation of biodiversity in Zambia has raised fears that the biological resources might be headed for extinction. Environmental degradation by human has greatly contributed to global warming (Mohamed Salih, 2001; Adams, 2003; UNEP, 2003). Global warming has consequently brought about climate change as elaborated below.

2.2.4 Causes of Climate Change

The Earth regulates its temperature with the help of greenhouse gases (carbon dioxide, methane, nitrous oxide) that occurs naturally in the atmosphere. Human activities have led to a rapid increase of greenhouse gas (GHG) emissions causing excessive warming of the planet. Global warming is disturbing the climate balance causing more droughts, floods and storms. Sources of greenhouse gas emissions include but not limited to: unsustainable cutting of trees (deforestation), burning of trees, agricultural residues and waste, charcoal production, fumes from vehicle exhaust and diesel generators, fumes from industrial processes, burning of fossil fuels (oil, coal and gas) for energy production, emissions from unmanaged landfills and livestock production (Brundtland, 1987 and UNEP, 2003).

There is now overwhelming scientific evidence that climate change is real and much of it is being caused by human activities with grave impacts to be expected (Adams, 2003; FAO, 2001; Namafe, 2006; Silver and DeFries, 1991). The causes of human induced climate change beside deforestation are the release of greenhouse gases emissions into the atmosphere which trap heat resulting in the increase in average temperatures, a

process called greenhouse effect resulting in global warming. These greenhouse gases released into the atmosphere include carbon-dioxide, methane and nitrous oxide, among others.

These gases are produced through most of our economic activities, including energy production and use, industrial process, transportation, agriculture land use and waste management.

Effects of climate change

Climate change threatens the reverse gains that have been scored in several sectors of many economies, including poverty reduction efforts in most developing countries like Zambia. In general, climate change will affect the basic elements of life for people around the world. This will include access to water, food production, health and the environment. According to the most recent assessment report released by the Intergovernmental Panel on Climate Change (IPCC) in May 2008, hundreds of millions of people will suffer hunger, water shortages and coastal flooding as the world warms up (www.undp.org).

Zambia has already started experiencing adverse effects of climate change. For example, the floods and droughts that the country experienced in the recent past may be attributed to adverse effects of climate change. We need to help our people in rural communities, in particular, to understand what is happening in order to take precautions when building or farming in flood prone areas such as valleys. These effects have the potential to frustrate the smooth implementation of our development strategies, including the Fifth National Development Plan (FNDP) and the Vision 2030.

International framework

The international community realized this threat caused by this problem of climate change some time back and came up with a mechanism to deal with it. By its nature, climate change is a global concern and requires concerted efforts from the global community to deal with it. Therefore, the issue of climate change is covered under an international agreement called the United Nations Framework Convention on Climate Change (UNFCCC), which was negotiated and adopted in 1992 (<http://unfccc.int>). The

UNFCCC is an international environmental convention that sets an overall framework for Governmental efforts in tackling the challenges posed by climate change. The objective of the UNFCCC is to stabilize Greenhouse Gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous human induced interference with the climate system.

The Kyoto Protocol (KP), a legally binding instrument gives industrialized countries the primary responsibility to take the lead in reducing emission levels. The reason is that these are the countries that have historically contributed more emissions through their industrial activities. Zambia signed the convention on the same day it was adopted on 11th June, 1992 and ratified it on 28th May, 1993. The nation also signed the Kyoto Protocol on 5th August 1998 and ratified it on 5th October 2006 (www.necz.org.zm).

2.2.5 Approaches in Combating Climate Change

There are basically two approaches in combating climate change that human society can use. The first one is to reduce green house gases emitted into the atmosphere in order to slow down the process. This is called mitigation under the UNFCCC (<http://unfccc.int>).

The second approach is to devise ways and means of reducing impacts of an avoidable climate change on society. This is called adaptation under the UNFCCC. Adaptation is important in our context as effects of climate change are already being experienced in many countries, including Zambia. As stated earlier, as a country, Zambia is party to two international instruments of tackling this challenge, namely: the UNFCCC and KP. This puts Zambia within the international framework of dealing with climate change. As such, the nation has responsibilities that come with such international agreements.

In the area of adaptation, the Zambian government, through the Ministry of Tourism, Environment and Natural Resources with support from UNDP has just completed the formulation of the National Adaptation Programme of Action (NAPA). The government, through the ministry, recently launched this programme (www.necz.org.zm). The NAPA has helped the country to identify most vulnerable sectors of our economy and recommend adaptation activities that are needed to alleviate the impacts.

The sectors that have been identified as the most vulnerable to adverse effects of climate change by the NAPA include agriculture, health, water and energy as well as natural resources, particularly forests and wildlife. The challenge that Zambian environmental adult educators now have is to help implement these interventions so that we safeguard our development and people's lives. The government of Zambia, through the Ministry of Tourism, Environment and Natural Resources, is also doing a lot in other areas of dealing with the threat of climate change. For example, a vigorous campaign of creating awareness among the most vulnerable communities in the rural areas has been undertaken in all provinces this year with only Lusaka remaining to be covered (www.necz.org.zm). This is important as our people need the information that will empower them to take measures at the household level to safeguard their livelihoods through active participation.

Coordination

Climate change is not only an environment problem, but an economical one affecting all the sectors of our economy. Therefore, the Ministry of Tourism, Environment and Natural Resources in Zambia collaborates with a lot of line ministries such as Education, Health, Agriculture and Cooperatives, Land, Justice and Local Government and Housing. Other institutions like Non-governmental Organizations and the private sector are also dealing with the problem. It is important so that we take early action in combating climate change because the economic implications of delayed action are too ghastly to contemplate.

In this regard, everyone in the nation - especially adult educators, is a stakeholder and needs to take keen interest in this issue and join hands in building capacity among our people to enable them cope with the adverse effects of climate change. In the meantime, using dialogue education, we can engage the international community to ensure that countries that are largely responsible for this problem take the lead in reducing the emissions and provide support to developing countries like Zambia to enable us cope with the problem. We all need to account for our actions with regard to environmental sustainability. It is critical to stress the importance of adaptation to climate change by stating that it is either we adapt or we become extinct as a human race.

2.3 Possible Approaches to Curb Environmental Degradation in Rural Communities

Recent studies show that environmental degradation was a global problem whose solution lay in shared efforts to encourage the *active participation* of civil society and Non-governmental Organizations (ECZ, 2001; FAO, 2001; Chipili, 2006). Active participation can best be realized when discussions among stakeholders are followed by actions to solve identified challenges. The role of the dialogue among civilizations and the establishment of new ways of working together are paramount in this endeavour: it is only through a constructive and inclusive dialogue that the means to eradicate poverty, to preserve biodiversity, sustain cultural diversity and disseminate knowledge can be identified and shared.

A literacy worker or adult educator who understands his or her work well cannot define it narrowly – that is, merely in terms of teaching of reading, writing and arithmetic to illiterate adults. A functional or livelihood literacy worker, while he or she is teaching the three Rs to adult groups, is also providing them with training in new economic skills. At the same time, he or she is arranging new social experiences and creating new modes of political education. He or she is intervening in the lives of people and in community structures in many different and important ways. He or she is a culture-maker. Culture-making is a serious business. To meet the challenges of his/her new role of culture-maker the adult educator would require knowledge and comprehension equal to his/her new image. The adult educator must have visions that are global, and a sense of humanity that can accommodate all human beings. To great ends he/she must add effective means. He/she must not be naïve about the existing social, economic, political and institutional structures. He or she must have some understanding of how they are put together and how they might be renewed or changed to serve humanity (<http://www.undp.org>).

The world community faces unprecedented ecological challenges in the twenty-first century. Many political and business leaders have embraced the idea of *sustainable development*, calling for economic growth without destroying the natural environment or depleting the natural resources on which future generations will depend (Haugen, 2006). Yet the concept has remained controversial, and implementation has been difficult. The

task for policy makers and corporate leaders will be to find ways to meet both economic and environmental goals in the coming decade, without sacrificing either

In Africa, environmental issues are also frequently sidelined on most policy makers' agendas due to insurmountable economic and social problems that the continent continues to face. Notwithstanding the economic and social hardships, as Africa constantly strives towards attaining economic development, environmental sustainability remains a key area of concern (UNEP, 2003) although usually remote to most economic policy makers. In addition, environmental sustainability is hardly seen by many in Africa as an underlying factor in economic development yet it is so critical that, if adequately and promptly addressed, will have positive secondary effects on other crucial areas pertaining to economic development and people's welfare.

Chipili (2006) found that World Vision Zambia (WVZ), an international Non-governmental Organization, was using basically five methods in their environmental education process with Congolese refugees at Kala Camp in Kawambwa, Zambia. These were billboards written in the refugees' own local language; seminars and workshops on environmental management; interactive meetings; field-based environmental education; and practical demonstrations such as how to construct a mud stove and demonstrating its effectiveness in wood fuel consumption.

Elsewhere in Africa, studies reported by UNEP (2003) reveal that in Kenya and Tanzania, the mass media plays a significant role in educating the illiterate masses in rural areas. A number of educative programmes on environmental sustainability and related issues are broadcast in Swahili on radios. Community leaders form listening groups which discuss the topics in detail and share the knowledge with their subjects so that they can strive to get out of the poverty cycle intertwined with environmental degradation. This is a clear illustration that illiterates are still very critical in society, particularly in Third World African countries where indigenous knowledge was considered useless by Western colonizers and the "educated" Africans that have been fooled for so long a time to totally discard their ancestors' African traditional way of life (Mtonga, 2007).

Literature also shows that widespread environmental degradation in the rural communities of the third world is aggravating poverty and food security, and forcing rural people to exploit dwindling resources to meet subsistence requirements (FAO, 2001; UNEP, 2003). This can negatively affect many nations' development processes and destabilize society. Everyone in society should actively contribute efforts to ensure environmental sustainability. The world's future is dependent on it. Poverty reduction efforts must be based on sound environmental management since the critical ecosystem services the environment provides – such as food, fresh water, soil protection, disease regulation and flood control – contribute in important ways to the livelihoods, health and security of people living in poverty – particularly women and children. Furthermore, expanded public and private investment in environmental assets – biodiversity, land and water – can generate strong returns for poverty reduction, contribute to pro-poor growth and accelerate progress towards all of the MDGs.

Despite their critical importance, ecosystems continue to be degraded at an alarming rate. The Millennium Ecosystem Assessment (MEA) found that 60 per cent of ecosystem services are used unsustainably and concluded that “any progress achieved in addressing the goals of poverty and hunger eradication, improved health, and environmental protection is unlikely to be sustained if most of the ecosystem services on which humanity relies continue to be degraded” (UNEP, 2003: 28).

We need a holistic approach. We need to educate masses and involve all strata to get desired results. Our basic priority as adult educators is to get everybody on board to conserve our environment.

2.3.1 The Need for Environmental Adult Education

Environmental problems are a reality in today's culture that cannot be ignored. Growing environmental troubles that the world is facing today include:

- Global warming,
- Pollution,
- Habitat devastation,
- Overpopulation,

- Waste disposal and
- Diminishing resources.

As it can be seen, education is the key to reaching environmental sustainability. In this instance, sustainability is defined as “developing a way of human living that will ensure an enduring and sufficient level of support from the earth’s resources” (Parker and Towner, 1993: 7). *Environmental adult education* applies *adult education* theory to *environmental* issues such as biodiversity and conservation.

2.4 Conclusion on Literature Review

Several lessons were drawn from the literature reviewed. For instance, the fact that had been established was that the aspect of learning about environmental sustainability has been there in indigenous communities from time immemorial. Literature seems to emphasize that most of the learning among adults takes place in informal settings (OECD, 1977; Freire, 1973; Vella, 2004). It appears from available literature that most of this informal learning involves listening and speaking (Salopek, 1999; Pearson *et. al.*, 2003). These are the major skills utilized in dialogue education and are consistent with the critical theory as well as transformative learning. Elsewhere in the world, studies conducted support that most illiterate adults learn through informal education; they learn using reflection and action.

Despite differences of opinions by researchers on levels of awareness on environmental sustainability, they however agree that studies conducted in most Third World countries, including Zambia so far reveal that the levels of awareness on environmental sustainability are low (FAO, 2001). However, there seems to be very scant information, more so from the Zambian perspective on levels of environmental awareness among adults who cannot read and write in rural communities. No known study has been done in this area up to this point, hence the need for this study to fill this missing link as environmental sustainability is intertwined with development.

Throughout, literature showed that there are several alternative ways through which people learn about environmental sustainability such as traditional environmental knowledge, radio, interactive dialogue, billboards, films, printed material like posters and

Internet. It was, therefore, hoped that the lessons drawn from the existing literature would help solve the problem of low awareness of environmental sustainability among adults in “Showground” compound and “Kakweŵa-Lusowe watershed” communities in Petauke district.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The methodology used in this study is outlined in this chapter. The sections here include description of study area, study design, the methods used to collect the data, population, sampling procedure, instruments used to collect the data and procedure for data collection. In addition, methods on how data was analyzed are presented.

3.1 Description and Location of Study Area

This study was confined to Petauke district. The district is located in a rural area in Eastern Province of Zambia at 14° 15 South, 31° 20 East (Davies, 1971). It is named after Petauke stream, a tributary of Luangwa river, whose source is at Nyakolwe hills where the old British Overseas Military Administration (Boma) was situated. The district is blessed with beautiful natural forests and mopane woodlands, wildlife, part of the famous Muchinga escapment with its beautiful scenary, part of Luangwa South National Park, Luangwa river, minerals and large pieces of land suitable for agricultural activities. These natural resources need to be sustainably utilized so that they can contribute to sustainable development for the local people and the country. The district is situated 400km east of Lusaka and 170km west of Chipata, the provincial capital. Petauke is bordered by Nyimba, Mozambique, Katete, Mambwe and Serenje district.

The main spoken language among the indigenous residents is *Chinsenga*. Like the Tonga of Southern Province, the Nsenga people do not know exactly where they came from, although it has been accepted that they were among earliest migrants from the great Luba-Lunda, probably came following the escarpment together with the Zulu, Shona (Karanga) and other southern African peoples in the fourteenth century. Phillipson (1976) and Tembo (1990) state that the Nsengas are generally said to have originated from Luba area of Shaba in Zaire, currently known as the Democratic Republic of Congo. Much of Petauke district is traditional land under Senior Chief Kalindawalo, Chiefs Mwanjawanthu, Nyamphande, Sandwe, Mumbi and Chieftainess Nyanje. State land is

mostly around the urban area, popularly known as Boma (township) which extends from Mupwa forest reserve on the north to Petauke Turn-off area at Chibisa village along Great East Road on the south.

As alluded to earlier, Petauke is in a rural area, which tends to be among the poorest parts of the country. High poverty levels in rural areas in Zambia stand at 80 per cent (Times of Zambia, 2008). The people in Petauke district are mainly subsistence farmers and official employment accounts for less than 10 per cent of the district population. The agriculture practiced is mixed farming, crop production and livestock rearing. Farmers produce maize, cotton, sunflower, groundnut, soya beans, cassava and many other crops. They also rear animals like cattle and goats.

Industries include milling cotton, three breweries, a bakery and a number of small-scale maize and oil milling enterprises. During the 2007 economic census the population of the district was estimated to be about 300,000, of which 130,000 lived within a 10km radius of Petauke town. The youth population of the district was about 240,000. Within Petauke township that figure is about 90,000. There were more females than males in the district. Petauke township itself is a small commercial centre. Houses consist of a small number of burnt pan brick buildings, mostly in the town centre, but most of the population in the district live in thatched mud huts, mud brick houses or similar dwellings (Central Statistical Office, 2007).

Water is piped to about 1,500 households in the township, but of those, only 30 per cent have water piped to them directly. For example, in the “Showground” compound, about 750 houses share 70 communal taps. Running water is on for two hours a day. In the rural parts of the district, water comes from manual boreholes where available. The rest of the population rely on rivers, dams, wells or waterholes. Often people need to walk several kilometres to the nearest water source. Only 37 per cent of the population have access to safe drinking water (Ibid).

Electricity is provided to Petauke township only. Supply is erratic, with regular power cuts lasting from a few hours to a number of days, especially in the rainy season as electrical storms and floods affect the supply routes. Most telecommunication is by two

community radio stations: Petauke Radio Explorers and PASME radio station. These are the mostly used media by chiefs to disseminate their information to their subjects as their transmissions cover Petauke, Katete, Nyimba, Mambwe and parts of Mozambique, Serenje and Chipata. The most popular Internet provider in the district is the Petauke Radio Explorers 88.3fm. The population at the township, and some parts of Chief Kalindawalo, Mumbi and Nyamphande also have access to mobile phone services provided by three mobile phone service providers: Zain, MTN and Zambia Telecommunications Corporation (Zamtel).

The region around Petauke is rich in minerals. Petauke has nearly 1.6 million tonnes deposits of phosphate which can be used in the production of compound D fertilizer (www.times.co.zm). The revelations that \$10 million worth of rutile minerals in Petauke are not being exploited due to lack of capital should attract various stakeholders in the business and financial sectors to invest in the mineral. Rutile, which is on very high demand in the United States, contains four - sometimes five - components, namely iron, titanium, tantrite, niobium and tin. It is not only rutile but several other minerals such as bluesky, quartz, iron, lime, traces of cobalt which are also present in the area. During this study (between August and September, 2008) members of the Petauke District Business Association (PDBA) displayed their minerals to the business community in the area. One company that took part in the exhibition was ELK International which has also been carrying out explorations in the area. According to the company's chief executive officer Andrew Mazimba, explorations have revealed that digging just six metres deep, there were 14 million tonnes of titanium. "We don't want foreigners to come and mine the minerals at the expense of the Zambian investors. That is why it is important for us, indigenous Zambians, to invest into this kind of business," he said (<http://www.times.co.zm>). More than 10,000 locals are expected to benefit from the project in terms of jobs and contracts while about 100 women would also be employed to separate residue.

Petauke district is poised to be among the major contributors to Zambia's economic development following the discovery of minerals in the area besides its potential in agriculture and tourism. However, the minerals in the region are somewhat low grade

hence no much serious mining investment had been made in the region by the time of the study. Oral history has it that in the early 17th century, gold was mined and that contributed to high rate of slave trade; mostly, the Swahili speaking peoples invaded the area.

Food availability and varieties are limited, and mostly dependent on the rainfall. Nutritional standards are low, although outright famine is unusual in the district as normally the annual rainfall is sufficient to grow maize, the staple food in the area. However, when rainfall is insufficient and the harvest poor there can be food shortages and the district then relies on either domestic or international food aid. The district has Petauke district hospital, Minga Mission hospital and Nyanje Mission hospital. The township also has an urban clinic. Local amenities include some clay football pitches, a number of public houses, some beautiful lodges such as Chimwemwe and Nyika Motel, and one very under-resourced public library.

Schooling is somewhat adequate with reasonable attendance rates by national standards, although facilities like textbooks and desks are generally very poor. This schooling has brought a problem of illiteracy in the district which was unheard of in pre-colonial Petauke. Illiteracy is high in the district, especially among the indigenous people – children and adults alike (CSO, 2003).

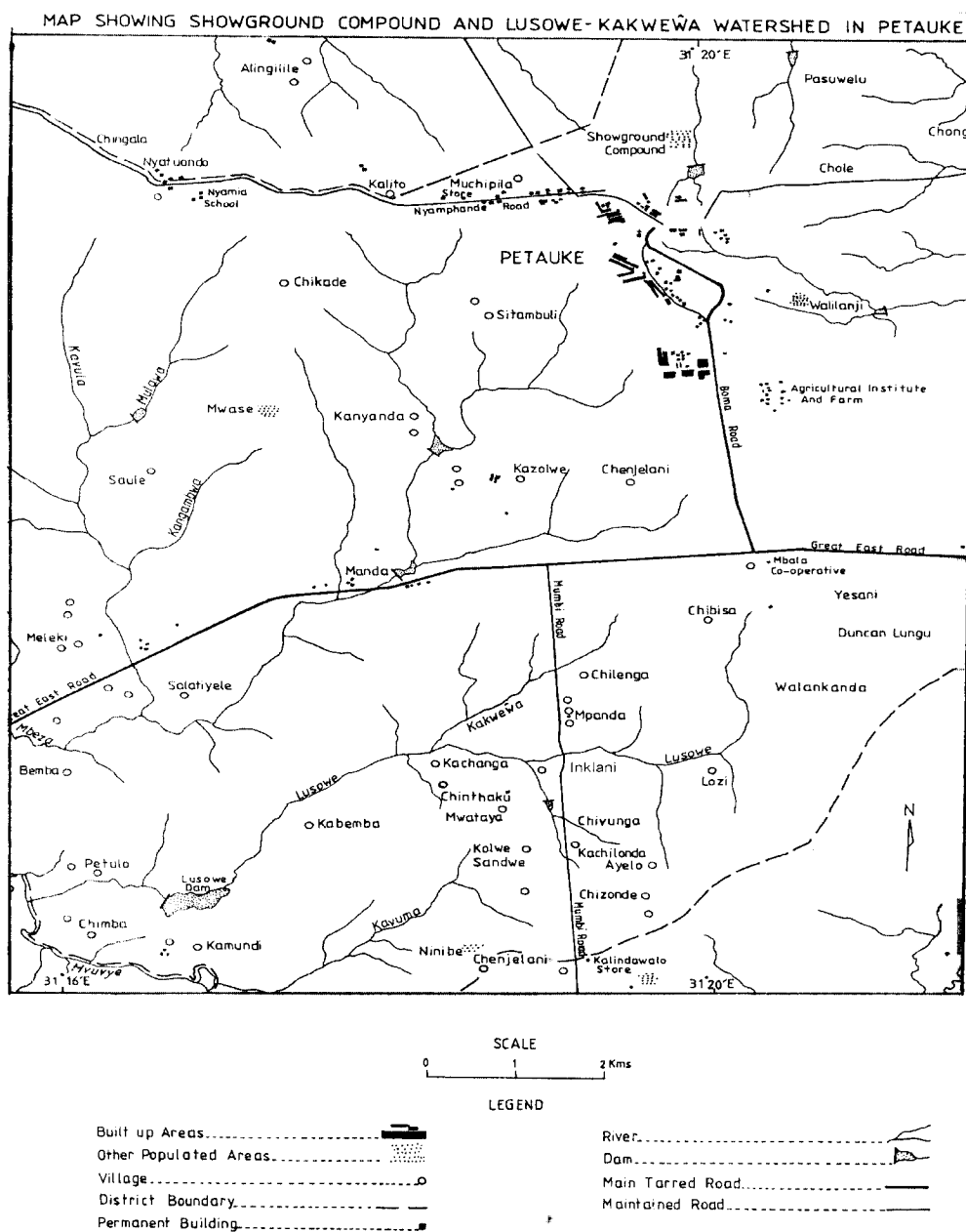
Figure 2: A sketch of Zambia showing location of Petauke district in Eastern Province



Source: Adapted from Davies, D.H. (ed) (1971), *Zambia in Maps*. London: University of London Press.

The study was particularly confined to the “Showground” compound in the peri-urban area of Petauke and “Kakweŵa-Lusowe watershed” communities in Senior Chief Kalindawalo chiefdom shown as in Figure 3.

Figure 3: Map showing study areas in Petauke district



Source: Adapted from *Map Sheets* 1431 A2 and 1431 A4 of Petauke, published by Survey Department, Lusaka, 1969.

The watershed in this study comprised Chibisa, Kalenga, Mphanda, Inklani, Kachanga, Chinthaku and Kabemba villages as shown in Figure 3.

3.2 Research Design

This research was a case study. A case study seeks to describe a unit in detail, in context and holistically (Merriam and Simpson, 1995; Kombo and Tromp, 2006). This enables the researcher to involve an in-depth examination of the study in a naturalistic context to come up with a grounded theory. The study employed the qualitative more than quantitative approach in data collection and analysis. Qualitative research uses the natural setting as the source of data. The researcher attempts to observe, describe and interpret settings as they are, maintaining what Patton (1990) calls an “empathic neutrality” (1990: 55). Qualitative research is concerned with developing explanations of social phenomena. That is to say, it aims at helping us to understand the world in which we live and why things are the way they are. It is concerned with the social aspects of our world and seeks to answer questions about:

- why people behave the way they do?
- how opinions and attitudes are formed?
- how people are affected by the events that go on around them?
- how and why cultures have developed in the way they are?
- the differences between social groups.

Qualitative research is concerned with finding the answers to questions which begin with: why? how? what? In what way? Quantitative research, on the other hand, is more concerned with questions about: how much? How many? How often? To what extent? It is used in studies with research questions needing either ‘yes’ or ‘no’ as the answer (Merriam, 1988).

In this study, quantitative methodology was mainly used for the questionnaires. Qualitative methodology on the other hand, used semi-structured interviews and focus group discussions (FGDs), as well as field observations.

3.3 Target Population

During the 2007 economic census the total population of Petauke district was estimated to be about 300,000 (Central Statistical Office, 2007). The target population of this study

consisted of all adults in Petauke district. All institutions which provide education in environmental sustainability were also part of the study population

Adults were selected as the study population because the study was aimed at investigating how illiterate and semi-literate adults of “Kakweŵa-Lusowe watershed” in Senior Chief Kalindawalo’s chiefdom and “Showground” compound learn about environmental sustainability. For purposes of communication convenience to the researcher, the population was restricted only to the adults in the *Chinsenga*-speaking areas of Eastern Province in Zambia. Local leaders were also included in the study for cross validation purposes.

3.4 Study Sample

The sample consisted of 58 subjects. These included 12 resident adults and eight local leaders who completed questionnaires. In addition, the district commissioner, district administrative officer at the district council, district education board secretary, district community development officer, district forestry officer, district agricultural coordinator, district development committee chairperson, seven village development committee chairpersons in the “Kakweŵa-Lusowe watershed”, seven village headmen and Senior Chief Kalindawalo were purposively selected for in-depth interviews. Six “Showground” compound residents and 12 villagers in the watershed community also participated in focus group discussions of six people each. For purposes of convenience to the researcher, the sample only comprised respondents who resided in the “Showground” compound and “Kakweŵa-Lusowe watershed” communities in Petauke district, Zambia.

3.5 Sampling Procedure

Simple random sampling procedure and purposive sampling were used to collect data. Simple random sampling was used to collect data from 12 respondents who completed questionnaires: five respondents from the “Showground” compound in Petauke township and the other seven from the “Kakweŵa-Lusowe watershed” in Senior Chief Kalindawalo chiefdom, Petauke.

Lottery technique was employed to pick five house numbers for the sample in the “Showground” compound. A list of house numbers was obtained from the Resident

Development Committee (RDC) offices by the researcher. The list had 500 numbers that used to pay for TV licences. The house numbers were written on small pieces of paper which were put in a black plastic bag and shuffled several times. One RDC official was asked to pick five pieces of paper from the plastic bag. The house numbers on the pieces of paper picked were used to identify the physical addresses where adult residents were interviewed. In the “Lusowe-Kakweŵa watershed” community, lists of names were picked from village registers in each of the seven villages. In each village the names of adults who had national registration cards were picked and written on pieces of papers. The pieces of paper were put in a black plastic bag. The village headman was asked to pick one piece of paper in each village. The headmen directed and introduced the researcher to the person picked to be interviewed. Although time consuming, the simple random procedure was chosen because it provides each element in the population an equal chance to be selected as a study sample (Cohen *et. al.*, 2000; Kombo and Tromp, 2006).

Purposive sampling was used to get information from key informants. These were the local leaders. Purposive sampling seeks information-rich cases that can be studied in depth (Patton, 1990).

3.6 Research Instruments

The quality of research depends, to a large extent, on the quality of the data collection tools. The present study used a mixture of data collection instruments. Two sets of questionnaires were used to collect the necessary data from local leaders and adult residents. A semi-structured interview guide was used to collect in-depth data from adult residents in the two selected study sites. A focus group discussions guide was further used to obtain data from adult residents of “Showground” compound and “Lusowe-Kakweŵa watershed” communities. An observation sheet was also used to obtain data on environmental degradation in the study area and people’s practices related to environmental degradation and mitigation actions. The researcher acted as the “human instrument” of data collection. In addition to these, the researcher analyzed records (documents) to obtain secondary data from available records and other literature on similar studies.

Two sets of questionnaires were used to collect data from 20 respondents. One set was prepared for local leaders and the other for the adult residents. The purpose of each questionnaire was indicated in each questionnaire. The questionnaires were divided into sections. Each section had a variety of questions. Questionnaires were chosen as instruments for data collection because they could be presented to each respondent in exactly the same way to minimize the role and influence of the interviewer and to make a more objective comparison of the results. Likert scales were used in many questions. Likert scales were chosen for this study because they are suitable in attitude measurement. In addition, studies have strongly found out that Likert scales are easy to construct, have high coverage of response categories, i.e., use a five points scale, have high precision and reliability (Likert, 1932 and Edwards, 1957 cited in Sarantakos, 1993). The two sets of questionnaires used have been appended to this report.

3.7 Data Collection

To obtain the needed data from the sampled participants, the researcher got written permission from the University of Zambia authority which was presented to the office of Petauke District Commissioner and District Education Board Secretary for introduction and to seek permission to conduct research in the district. The study used a combination of data collection techniques. It utilized a combination of both participatory and non-participatory methods to gather data so as to increase reliability. Questionnaires were administered to key informants. Focus group discussions were held in the “Showground” compound at the township and in villages in the “Kakweŵa-Lusowe watershed” area to collect in-depth data. Interviews with respondents who could not understand English were conducted in *Chinsenga* - the main local language of Petauke. Both non-structured and structured interview schedules were used depending on the theme. The study used more qualitative than quantitative methods and stressed the importance of context and the participant’s frame of reference.

The semi-structured interview method was used to collect the data from the sample. Two sets of questionnaires were prepared and administered to the respondents in the sample as follows: one set was administered to the local leaders while the other was administered to the 12 residents of “Showground” compound and “Kakweŵa-Lusowe watershed”

communities. Each set of questionnaire had a number of questions with precise instructions on how to answer them. The respondents who were not able to read or write were assisted to understand by the researcher so that they could provide responses to the questions in the questionnaire in *Chinsenga*, the language they understood.

Informal interviews with key informants and other members of the local communities, and non-participant observations as well as document review were also employed as data collection techniques. Field observations were guided by a check list which facilitated the collection of data pertaining to environmental activities in the communities under study. All data was collected by the researcher himself using cassette tape recorder, notebooks, pens and pencils, and camera.

3.8 Data Analysis

The process by which data is processed and converted into meaningful statements is referred to as data analysis and interpretation (Ghosh, 1992; Sarantakos, 1993). The purpose of data analysis is to process raw data for interpretation. Quantitative data collected in this study was analyzed using the Statistical Package for Social Sciences (SPSS) in order to obtain frequencies and percentages. Data was summarized using descriptive statistics such as percentages and frequency distributions. The views of subjects collected in qualitative data was organized in common themes and analyzed by way of narration while quantitative data was presented in tables.

The SPSS was chosen for quantitative data because it helps to obtain frequencies and percentages in an accurate, precise, easier and fast way. In order to obtain the required information, numbers were assigned to response categories to which individuals belonged. To illustrate this, sex as a variable was divided into two categories namely male and female. The number one (1) was assigned to male and two (2) to female. Scoring consisted of counting the number of the respondents who indicated that they were male or female. The scores were expressed in tables consisting of frequencies and percentages.

In questions requiring an adult or local leader to indicate the degree of agreement or disagreement, a Likert scale involving the allocation of a score to each point on the scale

was assigned. A positive item was scored by the following key: Strongly agree (SA) = 1, Agree (A) = 2, Undecided (U) = 3, Do not agree (DNA) = 4 and Strongly do not agree (SDA) = 5. The negative item was scored by the following key: SA = 5, A = 4, U = 3, DA = 2 and SDA = 1. Thereafter, responses for all adult respondents and local leaders were added up in order to determine the percentage of respondents who had positive and those with negative views on the awareness of environmental sustainability.

This study made use of the triangulation technique to establish the accuracy of responses. Triangulation allows the researcher to test one source of data against another (Chilisa and Preece, 2005; Kombo and Tromp, 2006). In this way it improves the quality of data and accuracy of the findings. In this study, data from focus group discussions and interviews were compared with data from the questionnaires, physical observations and relevant documents.

3.9 Ethical Considerations

Regarding issues of ethical consideration, the researcher carried a letter which was written by the Assistant Dean - Postgraduate in the School of Education, University of Zambia to the authorities in the study area to carry out the research in the community. This was done in recognition of their authority and to gain their support and cooperation during the study. Written consent from the office of District Commissioner was provided to allow the researcher to conduct a study in Petauke community. The researcher introduced himself and the purpose of the study was explained to the respondents. In addition, verbal permission was sought from each participant who was selected in the sample and confidentiality was ensured in that no names were indicated on the questionnaires. No resident was forced to give information when he or she was not willing to do so. The names of the participants were not included in this study. All participants in this study, therefore, remained anonymous.

3.10 Challenges Encountered in the Field

Some local leaders were reluctant to complete the questionnaire or participate in interviews. As a result, out of twenty questionnaires distributed, twelve were not completed or were reported to have been misplaced by clerical staff or family members.

Only eight questionnaires were collected by the researcher from the local leaders. However, the researcher managed to collect at least one of the two copies of questionnaires distributed in the four government departments and from four out of seven village headmen in “Kakweŵa-Lusowe watershed” area. Another challenge was the reluctance of some adult residents to complete questionnaires or participate in the interviews and focus group discussions. They viewed the study as just one of the common studies that just take their time without yielding results that would benefit them.

CHAPTER FOUR

PRESENTATION OF FINDINGS

4.0 Introduction

This chapter presents the results of the study on the role of dialogue education in ensuring environmental sustainability in Petauke district, Zambia. The findings are presented in three major sections according to the instruments used in this study. The findings are further presented under headings derived from the three objectives of the study. The headings include: (a) how illiterate and semi-literate adults in Petauke district learn about environmental sustainability; (b) levels of awareness of environmental sustainability among illiterate and semi-literate adults in rural communities; and (c) accessing possibilities of proposing additional approaches to curb environmental degradation in “Showground” compound and “Kakweŵa-Lusowe watershed” communities in Petauke.

In investigating these, critical aspects of environmental adult education such as the interrelationship between humans and their environment and constraints adult rural residents face were also examined.

4.1 Data Interpretation

Thematic analysis was used to analyze qualitative data. For instance, themes were established and views of respondents were grouped in such themes and described. On the other hand, quantitative data was analyzed using the SPSS. The SPSS was chosen because it helps to obtain frequencies and percentages in an accurate, precise, easier and fast ways. Interpretation of quantitative data involved the use of frequencies and percentages. The analyzed data is shown in form of tables. Data presented in tables was subjected to cross-tabular analysis for purposes of ranking and comparing the frequencies and percentages.

4.2 Findings of the Study from Focus Group Discussions and Interviews

The following were the findings of the study. The first section of our presentation brings findings from focus group discussions (FGDs) and in-depth interviews. In order to get a wide coverage of respondents’ views on how illiterate and semi-literate adults learn about

environmental sustainability, FGDs were held for adult residents in the “Showground” compound and “Kakweŵa-Lusowe watershed” communities. Some views captured from the FGDs are presented below.

4.2.1 “Showground” Residents’ Focus Group Discussion and Interviews Results

A group of six members of the “Showground” Resident Development Committee participated in focus group discussions and interviews in this study. It was difficult for the researcher to organize more FDGs as many adult residents viewed the study as just one of the common studies that just take their time without yielding results that would benefit them.

During the FGD in the objective of establishing levels of awareness among adults on environmental sustainability was investigated by using several sub-questions whose data is reported in this section. Some views from the FDG are presented below.

4.2.2.1 Establishing levels of awareness among adults on environmental sustainability

On the question of what they understood by “Make Zambia Clean and Healthy” campaign, the following responses were noted; comments such as sweeping our homes, surroundings, offices, market places, shops and other business places, and streets were strongly emphasized. Few also mentioned that residents should stop throwing rubbish on the street but in designated places. Most discussants in the group believed the campaign had nothing to do with protecting the natural environment as was evidenced when one member who stated that residents should jealously guard the natural resources like trees to help the community sustain a healthy life received strong opposing opinion. ‘We need trees for fuel like charcoal and firewood as many people cannot afford electricity and there is load shedding of electricity supply in the district. Selling of charcoal and firewood brings income to many youths and adults who are unemployed. Moreover, to construct decent houses in Petauke, we use firewood from trees to burn the pan bricks.’ This revealed low levels of awareness of environmental sustainability among most discussants in the focus group discussion but also revealed significance and consistency

with the needs theory of Maslow (1943), in which he indicated that people first think of satisfying their basic physiological needs which in this case were provided by the forest.

When asked who was supposed to take part in the campaign, it was strongly agreed that everybody should take part in one way or the other to “make Zambia clean and healthy.” The discussants went further to state that they contributed to the campaign by ensuring their homes, workplaces and business places were kept clean through sweeping. Washing clothes and bathing regularly were also mentioned by female discussants as other ways through which they contributed to the national campaign.

When asked on the benefits they get from the natural environment; the following responses were noted: trees add beauty and provide shade in the community; trees provide firewood and charcoal; soil enables farmers to grow crops for food to reduce hunger and provide income; and further, the land is very beneficial as it allows us to put up buildings and other infrastructure like roads required for development.

On the question of what it would be like if all trees were cut in their community; the discussants brought up very interesting responses. One discussant simply said that nature without trees is akin to “fish without water”. He went on to explain that trees were important, valuable and necessary to our very existence. “It’s not too hard to believe that without trees we humans would not exist on this beautiful planet. Trees are like the lungs of the planet. They breathe in carbon dioxide and breathe out oxygen. Trees are essential to life as we know it and are the ground troops on an environmental frontline. Our existing forest and the trees we plant work in tandem to make a better world. Do you know that when you cut down trees, you increase land temperature?” The question was posed to the group.

The discussants agreed that trees help humans in many ways. They reduce air pollution and global warming through respiration and removing particulate matter. They take in carbon dioxide (CO₂) and give out oxygen (O₂) that sustains life. CO₂ is one of the major contributing elements to the greenhouse effect. Trees trap CO₂ from the atmosphere and make carbohydrates that are used for plant growth. They give us oxygen in return which we breathe in to sustain our lives. Trees play an important role in maintaining a moderate

climate by lowering air temperature. They provide shade and conserve energy. They help to reduce noise pollution through absorbing and blocking noise from the urban environment. Besides, providing shelter and food for generations of birds and wildlife they reduce soil erosion too. Trees reduce runoff and erosion by storing water and breaking the force of rain as it falls. Trees have been providing the wood required for various purposes from firewood to building huge structures. Trees attract rain-bearing clouds. In countries like Zambia and other parts of the Third World where agriculture is the main occupation, the citizenry are heavily dependent on the rains for water. Many trees also provide us with medicinal products such as *Moringa* leaves, quinine and Eucalyptus oil. In fact, many medicines that we ultimately use are derived from trees and vegetation. This discussion among literate and illiterate adults in rural Zambia tally with the critical thinking in critical theory of Jürgen Habermas (Mezirow, 1981), and transformative learning theory of Mezirow (1991) highly acknowledged in dialogue education.

4.2.2.2 How illiterate and semi-literate adults in Petauke district learn about environmental sustainability

It should be remembered that one of the objectives of this study was to find out how illiterate and semi-literate adults of Petauke district learn about environmental sustainability. When asked how illiterate adults in their community learn about environmental sustainability, the following responses were noted. Most discussants said they learn through talking to family members, friends and neighbours as well as other associates they interact with. Others said they learn through radio, drama and television. Few still mentioned posters. Only one mentioned the Internet as a source of learning. These findings correlate with those reported by OECD (1977), Vella (2004), Participatory Community Development (PACODEV) (2004), Phukan (2005) and Chipili (2006) who also found that illiterates mostly learn through informal and non-formal education than formal education.

4.2.2.3 Accessing possibilities of additional approaches to curb environmental degradation

Another objective of the study was to access possibilities of additional approaches to curb environmental degradation in Petauke community. The discussants were of the view that there were possibilities for additional approaches to curb environmental degradation. In response to the question on what could be done to reduce environmental degradation, the discussants mentioned the following which were noted: introduce more active nature clubs in communities just as we have social clubs for women groups; intensification of sensitization to the public on causes and effects of climate change and encourage people to discuss how to adapt to climate change; environmental specialists, researchers, community workers and local leaders should continuously be discussing with various community members - using a number of medium - the impact of environmental degradation on their communities and to inculcate attitudes and values that will result in efforts to find solutions to the challenge; and encouraging dialogue on environmental issues at household level as family is a small but very significant unit in African culture.

4.2.2 “Kakweŵa-Lusowe Watershed” Residents’ Focus Group Discussions and Interviews Results

Two groups of six members each of the “Kakweŵa-Lusowe watershed” Village Development Committees participated in focus group discussions and interviews in this study. Just as in the “Showground” FDGs, the objective of establishing levels of awareness among adults on environmental sustainability was investigated by using several sub-questions whose data is reported below.

4.2.2.1 Establishing levels of awareness among adults on environmental sustainability

When asked what they understood by “Make Zambia Clean and Healthy” campaign, eight-five per cent of the discussants were in complete ignorance of the national programme that was launched on 15th June 2007 by the late Republican President Levy Mwanawasa, State Counsel. The study further reveals that even the discussant who expressed awareness of the campaign could only mention sweeping the home and surroundings as ways of contributing to “Make Zambia Clean and Healthy.” The

discussants, however, became more active on the question of what benefits they got from natural environment. The following responses were noted; nature gives us soils and rain, critical in farming ventures. The discussants were of the view that their existence was completely dependent on the natural environment. “Nearly everything you see in this village comes from natural resources: our houses are built using trees, soil, bamboos and grass from the forest. The natural environment is the source of all our water, food and the air we breathe. When we are tired with our day’s work we rest on our traditional mats made from reeds cut from Kakweŵa and Lusowe rivers,” one elder discussant summarized.

When asked what life would be like in their community if all trees were cut down, ninety per cent were of the view that they would end up in worse poverty and gradual death. The discussants mentioned that already many of their maize fields look like deserts. “You only find trees at graveyards, along the river banks and in rocky places. The few trees survive because our tradition makes it taboo to cut trees from grave yards,” hinted another elderly discussant. Female discussants stressed that if all trees were cut people could be forced to walk very long distances to look for firewood for cooking purposes and grass for house-thatching. Some stated that lack of trees would further force all birds and wild animals that serve as food farther away. One still further said that water sources like dams would also dry up, and the soils would become very infertile for agriculture as tree leaves and dead branches add fertility to our maize fields. The discussants also interestingly noted that trees also reduce soil erosion, common in many parts of Petauke district.

4.2.2.2 How illiterate and semi-literate adults in Petauke district learn about environmental sustainability

Most of the discussants in “Kakweŵa-Lusowe watershed” FGDs were of the view that they learnt about environmental sustainability through existing traditional environmental knowledge (TEK) passed on from generation to generation through taboos, proverbs and story telling. “*Msolo* tree is still considered sacred here as our ancestors used to pray under this tree!” emphasized an old woman. The discussants further noted that despite TEK discouraging unsustainable cutting down of trees, the increasing population of

people was forced to cut down trees to meet their daily needs and sell some forestry products. Few discussants mentioned that they also learnt from their school-going children, family members, neighbours, friends, colleagues, and agricultural and forestry extension officers.

4.2.2.3 Accessing possibilities of additional approaches to curb environmental degradation

The discussants were of the view that there were possibilities for additional approaches to curb environmental degradation. In response to the question on what could be done to reduce environmental degradation, the discussants mentioned the following: elderly discussants strongly proposed reintroduction of *nsaka* where people could gather even one afternoon per week to discuss various important issues affecting the community such as environmental issues and other challenges. The study revealed that *nsaka* no longer existed in “Kakweŵa-Lusowe watershed” community for years as people were too preoccupied with making ends meet to spare time and gather with other members of the community and discuss ideas and learn survival skills as it used to be before the 1970s. The discussants also mentioned effective use of community radios as very few adults in the community want to go to school to learn how to read and write on environmental issues. Few mentioned importance of the use of proverbs, story telling, drama, and dances and songs. Others still mentioned introduction of environmental clubs in communities, education on organic and conservation farming and household or family level *nsaka*.

In a verbal interview in *Chinsenga* on 12 August, 2008, Mr Inklani Zulu about 88 years old of Inklani village in “Kakweŵa-Lusowe watershed” area stated that Nsengas have always relied on indigenous environmental knowledge for survival. “The forest is the immediate environment that provides for human needs. This symbiotic relationship is apparent to humans. It manifests itself in terms of water, food, medicines, shelter, and other forest products.” Villagers know which tree species are best for building poles or good as fuel wood, which wild fruits are edible and which are good for medicine. This view is supported by Ben-Erik van Wyk quoted in Kurian (2007) who confidently states

that African traditional medicine is the oldest and perhaps the most diverse of all medicine systems...it is a holistic system involving both body and mind.

This traditional environmental knowledge is an important ingredient in the ongoing effort to reverse the trend of environmental degradation in the area. To illustrate further on how significant traditional environmental knowledge is, the old man Inklani Zulu cited how Chinthaku (whom he considered a philosopher of the area) converted the once dry Kakweŵa stream to have a sustainable high water table and moist grounds from the 1960s to the present. Chinthaku, whose village is still known by this name, introduced reeds he got from the forest into the dry stream. Gradually, the reeds spread and managed to sustain good high water table (Zulu, 2008). Field observation by the researcher during fieldwork revealed that the stream was covered by dambo gardens locally known as *madimba*. The gardens sustain most livelihoods of the highly populated “Kakweŵa-Lusowe watershed”. The people of the area grow a variety of crops in these gardens throughout the year. Common crops found during the study included bananas, sugarcanes, *moringa*, tomatoes, maize, beans and a variety of indigenous and introduced vegetables. This can be an example of how a semi-literate elderly headman among the Nsengas used critical thinking to solve a problem of hunger and its related ills among his subjects.

4.3 Findings from the Questionnaires

4.3.1 Findings from Local Leaders’ Questionnaire

Twenty questionnaires were distributed to heads of government departments, resident development committee and “Kakweŵa-Lusowe watershed” village headmen. However, only eight were completed and collected by the researcher. The findings shown in this study are therefore based on the eight completed questionnaires by local leaders. At least a questionnaire was collected from each office were two questionnaires were distributed by the researcher to be completed by senior officers. The following were the results from the questionnaires.

Table 1: Gender of local leader respondents

	Frequency	Per cent
Male	7	87.5
Female	1	12.5
Total	8	100.0

Only 12.5 per cent of the local leader respondents were female while the majority (87.5%) were male.

4.3.1.1 How adult illiterates and semi-literates learn about environmental sustainability

One of the major objectives of this study was to find out how illiterate and semi-literate adults in Petauke district learn about environmental sustainability. The study revealed that 37.5 per cent of local leader respondents were of the view that illiterates learnt through dialogue. Twenty-five per cent indicated that illiterates and semi-literates did learn through the mass media like radio and television. Another 25 per cent of the responses showed that they learnt through drama (theatre for development), dances and songs. Only 12 per cent indicated that illiterates learnt through field demonstrations.

Table 2: Responses from local leaders on how illiterates learn environmental sustainability

	Frequency	Per cent
dialogue	3	37.5
mass media	2	25.0
drama, song and dance	2	25.0
field demonstration	1	12.5
Total	8	100.0

On the question of whether or not illiterates did learn about environmental sustainability in Petauke, the responses from the local leaders are summarized in Table 3.

Table 3: Responses from local leaders on whether illiterates do learn about environmental sustainability

	Frequency	Per cent
Strongly agree	2	25.0
Agree	5	62.5
Undecided	1	12.5
Total	8	100.0

4.3.1.2 Levels of awareness of environmental sustainability among illiterate and semi-literate adults in rural communities

The study revealed that five (62.5%) of the local leaders agreed that illiterate adults in Petauke did learn, while two (25%) strongly agreed that illiterate adults learnt about environmental sustainability. One (12.5%) was undecided on the question. These findings correlate with the findings in FDGs in both “Showground” compound and “Kakweŵa-Lusowe watershed” communities. Interestingly, Table 4 shows that five (62.5%) of the local leaders were of the view that although the illiterate adults learnt about environmental sustainability, they did not participate in environmental sustainability activities and related programmes. Furthermore, 12.5 per cent indicated that they strongly felt illiterate adults did not participate in environmental sustainability activities. The other 12.5 per cent were undecided on the question. Only a small percentage of 12.5 per cent of the respondents were in agreement that the illiterate and semi-literate adults in Petauke district actively participated in activities and programmes directly related to environmental sustainability. These findings are similar to those recorded by UNEP (2004) and ECZ (2001).

Table 4: Participation in environmental sustainability activities according to local leaders' responses

	Frequency	Per cent
Agree	1	12.5
Undecided	1	12.5
Do not agree	5	62.5
Strongly do not agree	1	12.5
Total	8	100.0

Further, the findings showed that the local leaders were of the view that levels of awareness of the need for environmental sustainability among illiterates and semi-literates in Petauke were low. For instance, only 37.5 per cent of the respondents agreed that illiterates were aware of the need for environmental sustainability in their communities (see Table 5). Twenty-five per cent of respondents were not in agreement that illiterate adults in Petauke district were aware of the need for environmental sustainability. Moreover, 12.5 per cent of the local leader respondents strongly did not agree that illiterates were aware of the need for environmental sustainability. The other 12.5 per cent were not sure in their responses.

Table 5: Illiterate adults' awareness of need for environmental sustainability

	Frequency	Per cent
Agree	3	37.5
Undecided	2	25.0
Do not agree	2	25.0
Strongly do not agree	1	12.5
Total	8	100.0

4.3.1.3 Room for additional environmental sustainability approaches

The study, encouragingly, revealed that 87.5 per cent respondents among local leaders indicated that there was room for proposing and implementing additional environmental sustainability approaches to curb environmental degradation in Petauke district. In

addition, 12.5 per cent were in strong agreement that there was room for additional environmental sustainability approaches. These findings are presented in Table 6.

Table 6: Is there room for additional environmental sustainability approaches?

	Frequency	Per cent
Strongly agree	1	12.5
Agree	7	87.5
Total	8	100.0

4.3.2 Findings from Resident Adults’ Questionnaire

This part of the chapter presents findings from resident adults of “Showground” compound and “Kakweŵa-Lusowe watershed” themselves. It should be borne in mind that this study tried to investigate the role of dialogue education in environmental protection among illiterates and how these illiterates learn about environmental sustainability.

Twelve residents responded to the questionnaire: five from “Showground” compound and seven from “Kakweŵa-Lusowe watershed” community. With regard to gender, findings showed that seven (58.3%) of the 12 respondents were male while five (41.7%) were female.

Table 7: Gender of resident adult respondents of showground and “Kakwewa-Lusowe watershed” in Petauke district

	Frequency	Per cent
Male	7	58.3
Female	5	41.7
Total	12	100.0

Table 8 shows that most of the respondents were adults of between 28 and 47 years who constituted fifty per cent of the respondents. Twenty-five per cent of the respondents were between 48 and 67 years old. Only one per cent was below 28 years of age. Similarly, only two per cent were senior citizens: one per cent was between 67 and 87 years old, and the other one per cent was more than 87 years of age.

Table 8: Year of birth of Petauke resident adult respondents

	Frequency	Per cent
1900-1920	1	8.3
1921-1940	1	8.3
1941-1960	3	25.0
1961-1980	6	50.0
1981-2000	1	8.3
Total	12	100.0

Data presented in Table 9 shows that eight (66.7%) of the respondents had lived in the district for more than 40 years at the time of the study. One (8.3%) had lived in Petauke for between 11 and 20 years. Three (25%) per cent of the respondents had lived in the district for less than 10 years. The data reveals that most respondents had lived for more than 20 years and were very familiar with the life experiences in their communities.

Table 9: Length of resident adult respondents' residence in Petauke

	Frequency	Per cent
1-10 yrs	3	25.0
11-20 yrs	1	8.3
More than 40 yrs	8	66.7
Total	12	100.0

Table 10 reveals that seven (58.4%) of the respondents depended on farming and gardening for their livelihood. Four (33.3%) of the respondents had trading as their occupation. Only 8.3 per cent of the respondents were in formal employment.

Table 10: Occupation of resident adult respondents in Petauke

	Frequency	Per cent
Farming and gardening	7	58.4
Trading	4	33.3
Formal employment	1	8.3
Total	12	100.0

These findings in Table 10 tally very well with the findings by CSO during the 2007 economic census (CSO, 2007) which stated that the population in Petauke comprised mainly subsistence farmers and official employment accounted for less than 10 per cent of the district population. The livelihood for the illiterate and semi-literate adults in Petauke can be said to be interdependent on the natural environment. This calls for environmental sustainability by all residents to benefit all.

4.3.2.1 How illiterate and semi-literate adults learn about environmental sustainability

One of the major objectives of this study was to find out how illiterate and semi-literate adults in Petauke district learn about environmental sustainability. The study revealed that 66.7 per cent of the respondents indicated that they learnt through sharing of traditional environmental knowledge with immediate family members, relatives, neighbours, friends and colleagues. The study also showed that 16.7 per cent of the respondents indicated that illiterates and semi-literate adults in Petauke learnt about environmental sustainability through the mass media such as radio and television (especially those in “Showground” compound, Chibisa and Chilenga villages at Petauke Turn-off who have access to ZNBC TV signal). The respondents indicated that field demonstrations by extension workers and drama, dance and song only contributed to the education of 8.3 per cent each as ways through which illiterates learnt about environmental sustainability. Table 11 presents these results.

Table 11: How illiterate adults learn about environmental sustainability

	Frequency	Per cent
Sharing traditional environmental knowledge	8	66.7
Mass media	2	16.7
Drama, song and dance	1	8.3
field demonstrations	1	8.3
Total	12	100.0

Table 12 below shows that 8.3 per cent of the respondents strongly agreed and 75 per cent of respondents agreed that illiterate and semi-literate adults in Petauke district did learn about environmental sustainability. However, 16.7 per cent of the respondents were undecided.

Table 12: Illiterates learn about environmental sustainability

	Frequency	Per cent
Strongly agree	1	8.3
Agree	9	75.0
Undecided	2	16.7
Total	12	100.0

4.3.2.2 Levels of awareness of environmental sustainability among illiterate and semi-literate adults in rural communities

Interestingly, data in Table 13 reveals that 75 per cent of the respondents were not aware of the “Make Zambia Clean and Healthy” campaign one year after its official launch by the late republican President Levy Patrick Mwanawasa. Only 25 per cent of the adult respondents in this rural district were aware of the “Make Zambia Clean and Healthy” campaign.

Table 13: “Make Zambia Clean and Healthy” awareness

	Frequency	Per cent
Yes	3	25.0
No	9	75.0
Total	12	100.0

In line with the “Make Zambia Clean and Healthy” campaign, the respondents were asked whether they were in agreement that illiterate adults were aware of the need for environmental sustainability. Data in Table 14 presents the findings where two (16.7%) were in strong agreement and three (25%) of the respondents agreed that illiterate adults are aware of need for environmental sustainability. Four (33.3%) of the respondents were undecided. Three (25%) of the respondents were in disagreement that illiterate adults were aware of need for environmental sustainability. These findings show low levels of awareness.

Table 14: Illiterate adults are aware of need for environmental sustainability

	Frequency	Per cent
Strongly agree	2	16.7
Agree	3	25.0
Undecided	4	33.3
Do not agree	3	25.0
Total	12	100.0

The data in Table 15, however, show that only 25 per cent of the respondents were of the view that illiterate adults in Petauke do not participate in environmental sustainability activities. 16.7 per cent were undecided while 58 per cent were in disagreement that illiterates do not participate in environmental sustainability activities.

Table 15: Illiterate adults do not participate in environmental sustainability activities

	Frequency	Per cent
Agree	3	25.0
Undecided	2	16.7
Do not agree	7	58.3
Total	12	100.0

4.3.2.3 Room for additional approaches to curb environmental degradation

The study findings reveal that 66.7 per cent of the adult respondents were of the view that there was room for additional approaches to curb environmental degradation in Petauke district. Only 33.3 per cent of the respondents were somehow pessimistic that the environmental chaos was an irreversible human action and there was no room for additional approaches to curb environmental degradation. These findings are in Table 16.

Table 16: Is there room for additional approaches to curb environmental degradation?

	Frequency	Per cent
Yes	8	66.7
No	4	33.3
Total	12	100.0

4.4 Findings from Field Observation

Fieldwork is an important component of any subject. Fieldwork in education circles may entail going out and exploring possibilities around you. One of the critical principles in adult education is the importance of the learner’s experience, participatory education. In adult education, participatory education is seen as a cyclical process during which participants identify and share problems from their daily lives. Then, as a group, they move from reflecting on the individual experience of these problems to more critical social analysis, to constructing an understanding of the social conditions affecting them, and then to developing strategies for action and change (Mtonga, 1986). Learners and educators are seen as equal participants in this process with educators relinquishing and students assuming positions of power and control. Adults have accumulated foundations of *life experiences* and *knowledge* that may include work-related activities, family

responsibilities, and previous education. They need to connect learning to this knowledge/experience base (Abadzi, 2003; Burbules, 1993 and Mezei, K., 1991). To help them do so, adult educators should draw out participants' experience and knowledge which is relevant to the topic. The researcher in this study involved field observation to capture some vital real life experiences related to the study objectives.

The emphasis on experience as a defining feature of adult learning was expressed in Lindeman's frequently quoted aphorism that "experience is the adult learner's living textbook" (1956: 7) and that adult education was, therefore, "a continuous process of evaluating experiences" (p. 85). This emphasis on experience is central to the concept of andragogy that has evolved to describe adult education practice in societies as diverse as the United States, Britain, France, Australia and the Third World countries in Latin America, Asia and Africa (Chilisa and Preece, 2005). The belief that adult teaching should be grounded in adults' experiences, and that these experiences represent a valuable resource, is currently cited as crucial by adult educators of every conceivable ideological hue. As in any other subject, fieldwork in adult education entails the same principles of learning through direct observation. In this study, fieldwork revealed some of the challenges related to environmental degradation and some local actions taken to mitigate the effects.

4.4.1 Humans' needs and their contribution to environmental degradation

As the Earth's population continues to grow, more resources are demanded. A desire for material goods also continues to be a main goal for people, and these two elements combined place an increased pressure on Mother Earth and subsequent environmental degradation. Field observations in Petauke revealed that deforestation had contributed most to environmental degradation. In the quest to meet their major needs, humans have fallen a lot of trees in the district. Trees have been fallen for various reasons like clearing agricultural fields, for human settlement and construction of a number of infrastructure, for commercial herbalists with the coming of HIV and AIDS, for firewood and charcoal as sources of energy. Below are some experiences captured by the researcher.



Plate 1: A truckload of firewood in Mupya hills area near “Showground” compound heading to Petauke township (photo by the researcher)

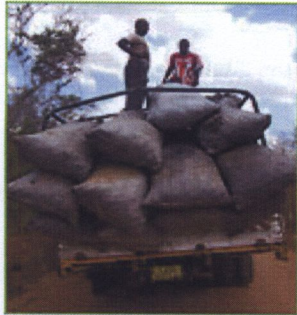


Plate 2: A truckload of charcoal in “Showground” compound, Petauke in 2008 (photo by the researcher)

Plate 3 below shows an eroded river bank in “Kakwewa-Lusowe watershed” and a bridge damaged by flooding caused by torrential rains. The floods washed away crops such as the staple food (maize) and not only in Petauke, but in many parts of Zambia in the 2007-2008 farming season. The disaster has resulted in significant food shortage, loss of income to farmers and increased poverty levels in rural Zambia. The devastating flooding and droughts that have been occurring in the country of late are associated with global warming (ECZ, 2001).



Plate 3: Lusowe bridge damaged at Mpanda village and river banks washed away by torrential rains that caused flooding in many areas of Zambia in 2007-2008 rainy season. (photo by the researcher)

Field observation further revealed that deforestation in Petauke has greatly contributed to soil erosion. Soil erosion potential is increased if the soil has no or very little vegetative cover of plants and/or crop residues. Plant and residue cover protects the soil from raindrop impact and splash, tends to slow down the movement of surface runoff and allows excess surface water to infiltrate. Plates 4 and 5 show soil erosion where deforestation had greatly contributed in Petauke's Mupya hills area near "Showground" compound.

Plate 4: Soil erosion damaged a road to "Showground" compound at Mupya hills. (photo by the researcher)



Plate 5: A family engaged in a dialogue at a village house in "Kukwela-Lakwela" community. (photo by the researcher)

Plate 5: Soil erosion resulting in poor crop production around Mupya hills (photo: courtesy of Farm Training Centre, Petauke)



It was interestingly revealed in field observation in this study that unlike in the past when adults used to gather under a tree to discuss various life issues and educate one another at *nsaka* – the African way - as reported in Msimuko (1987), villagers in the study area discussed issues and trained or educated one another at a family level in their households as shown in Plate 6 below. These findings imply the utilization of a form of dialogue education in the study area.



Plate 6: A family engaged in a dialogue at a village house in “Kakweŵa-Lusowe watershed” community. (photo by the researcher)

Through such family discussions and dialogue with other members of the community, few people have begun taking measures to mitigate environmental degradation in the district. Findings reveal that some people have embarked on processes of reforestation actions and encouraging regeneration of natural plants in the study area. These projects are mostly encouraged through community based natural resource management programmes in the district. Below is Plate 7 showing a man at the periphery of “Showground” compound raising a nursery of *Jatropha* plants meant for sale to interested farmers. Some environmental values about *Jatropha* and *Moringa* plants found being promoted in the study area are discussed in detail in chapter five.

Plate 7: An entrepreneur taking care of *Jatropha* seedlings in “Showground” compound (photo by the researcher)



Field observations also revealed that efforts were being made to curb environmental degradation in “Kakweŵa-Lusowe watershed”, especially along the river valleys through dambo gardening (*madimba*). A variety of crops are grown in these gardens throughout the year. Plates 8 to 13 show some gardening scenery in “Kakweŵa-Lusowe watershed”.

Plate 8: A farmer working in his garden of vegetables, sugarcanes and bananas in Kakweŵa dambo



Plate 9: A “greening” scenery of part of Kakweŵa dambo gardening area. (photo by the researcher)



*Plate10: A small plantation of Jatropha in a farmer's field in "Kakweŵa-Lusowe watershed" community.
(photo by the researcher)*



Plate 11: Moringa trees intercropped with irrigated maize in a farmer's field in "Kakweŵa-Lusowe watershed" community. (photo by the researcher)



Plate 12: Moringa trees planted at the edge of a Kalenga village in “Kakweŵa-Lusowe watershed” community. (photo by the researcher)



Plate 13: Small-scale farmers in their sugarcane garden in “Kakweŵa-Lusowe” watershed community. (photo by the researcher)



CHAPTER FIVE

DISCUSSION AND ANALYSIS OF KEY FINDINGS

5.0 Introduction

This chapter focuses on the discussion and analysis of the key findings of the study. Once again the reader will remember that the main purpose of the study was to investigate the role of dialogue education in ensuring environmental sustainability in rural Petauke district, Zambia. The order of the discussion follows the order in which the findings have been presented in the previous chapter. This order is in line with the study's three main research objectives:

- (a) to find out how illiterate and semi-literate adults in “Kakweŵa-Lusowe watershed” community and “Showground” compound community in Petauke district learn about environmental sustainability.
- (b) to establish levels of awareness of environmental sustainability among illiterate and semi-literate adults in “Kakweŵa-Lusowe watershed” community and “Showground” compound community in Petauke district.
- (c) to access possibilities of proposing additional approaches to “Kakweŵa-Lusowe watershed” and “Showground” compound communities in Petauke as solutions to curb environmental degradation.

The chapter is further divided into two parts. The first part discusses views of local leaders and the second part looks at resident adults' responses. The responses were obtained during focus group discussions and in-depth interviews as well as through completing semi-structured questionnaires. Findings from field observations are also discussed and analyzed.

5.1 How Illiterates and Semi-literates Learn about Environmental Sustainability

5.1.1 Local leaders' responses on how illiterates and semi-literates learn about environmental sustainability

In terms of gender, the study revealed that most of the local leaders who responded to the questionnaires were male (87.5 per cent). Only 12.5 per cent were female. As alluded to in Chapter four, these findings tally with the general scenario in the country where most

leadership and decision-making positions are occupied by males. This seems to stem from customary law in Zambia which generally asserts that males are heads of households and are better equipped to deal with decision-making, especially in rural areas (Lungu, 1989). Indeed, despite official pronouncements in favour of scaled-up women participation in political governance and decision-making processes, it is worrying that Zambia still consistently fails to meet benchmarks outlined in international and regional conventions such as the SADC Protocol on 30 per cent representation of women in decision-making positions (http://www.sardc.net/Widsaa/sgm/1999/sgm_ch3.html). Government and other leaders need to consider that at least 30 per cent of the decision-making positions in key ministries (Defence, Finance and economic planning, Education, Health, Agriculture, Tourism and Foreign affairs to mention but a few) are taken up by *deserving* women. Similarly, at the continent level, reporting on conference on women leadership UNECA (2005) states that Africa's regional average representation of women in national legislative assemblies stood at 11 per cent reflecting little progress in achieving the 30 per cent target of women in decision-making positions by 1995 set by the UN Economic and Social Council (UNESCO). There is still a great challenge to both men and women to strive towards achieving equity when it comes to leadership. This can be achieved by increasing gender awareness in the country. Furthermore, the female gender should rise to the challenge to excel in leadership if they are to achieve equity. Males cannot just give leadership positions to females just for the sake of equality, the female gender should strive to excel in life much more than they do now.

It seems from the study that many (37.5 per cent) local leader respondents were of the view that illiterate adults in Petauke district learnt through dialogue (see Table 2). Twenty-five per cent indicated that illiterates and semi-literates did learn through the mass media like radio and television. Another 25 per cent of the responses indicated that illiterates and semi-literates in the district learnt through drama (theatre for development), dances and songs. Only 12 per cent indicated that, in their view, illiterates learnt through field demonstrations organized by government and non-governmental organizations.

The notion of dialogue has been linked as an educational form from times of Socrate, through Plato, Piaget, Dewey (Bridges, 1988 and McPeck, 1990) and most probably

popularized by Paulo Freire. Dialogue education shifts the focus of education from what the teacher says to what the learner does, from learner passivity to learners as active participants in the dialogue that leads to learning (Freire, 1973; Vella, 2004). A dialogue approach to education views learners as subjects in their own learning and honours central principles such as mutual respect and open communication (Vella, 2002). The benefits of dialogue have been known since the dawn of history, but few masses in the Third World are aware that dialogue is a form of conversation and education with the power to transform lives of individuals, communities and organizations. A dialogue experience allows a free-flowing of ideas among members of a group, allowing the group to discover insights not attainable individually. Dialogue differs from discussion in that in discussion one is presenting ideas back and forth with the goal of coming to agreement or conclusion, while in dialogue the goal is to experience the process of deep listening and communicating rather than the outcome of a decision. It promotes critical thinking in the citizenry and creates knowledge in society.

The Greek philosopher Socrates is reported in Vella (2002; 2004) to have modeled a type of teaching and learning in Athens in the 5th Century BC which has been esteemed and emulated ever since. Socrates was willing to learn with anyone. Not teach them – but learn with them, asking interesting educative questions that inspired the person find his or her own answers. Socrates' questions helped his companion make new connections and forced him to examine the validity of his convictions. The Socratic method, when practiced with a spirit of equality, has a power to deepen and transform understanding as well as learning. This correlates with Jack Mezirow's theory of transformative learning (Mezirow, 1991) and Jürgen Habermas' critical theory (Mezirow, 1981) that promotes critical thinking greatly encouraged in dialogue education. In a group dialogue, following group dynamics, members help one another reconsider, reevaluate, and reassemble bits of information they already have, integrating them into a new, more inclusive whole.

In this study, since the findings revealed that local leaders and most resident adults interviewed indicated that illiterates and semi-literates in Petauke district mostly learn through dialoguing with others, it seems that environmental adult educators can tap on this strength to facilitate literacy for all to curb environmental degradation in

communities. This can be best achieved using locally organized groups like family leaders, village headmen and village development committees as a starting point for dialogue education in *Chinsenga*, the language the indigenous illiterates understand and operate in thoroughly to solve problems they encounter in life.

Problem solving using dialogue education in a group

Many a time groups find themselves unable to solve problems because they address the problem at a superficial level. After that they find themselves blocked because they cannot figure out why the problem occurred and how they can tackle it. Therefore, using dialogue education which this study forms a part, an effective problem solving procedure would simply be to:

1. define the problem as precisely as possible;
2. try to thoroughly explore and understand the causes behind the problem;
3. collect additional information, from elsewhere if necessary, and analyze it to understand the problem or challenge further; and
4. encourage cooperation in the group; the group should suspend criticism and judgment for a while and try to combine each other's ideas or add on improvements. The objectives should be to generate as many ideas and suggestions as possible. This is called “brainstorming” in a group, when individuals try lateral thinking.

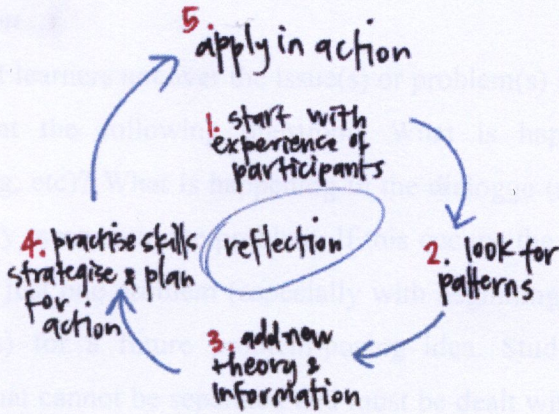
In dialogic education, however, the process of critical reflection is more than an intellectual exercise: reflection is always linked to action, which is then followed by a return to reflection. This cycle of reflection and action is called *praxis*. In sum, Freire (1973) proposes that the process of using dialogic methods to help people learn from their experiences can result in critical consciousness and collective action. Below follows a practical illustration of use of dialogue education in problem-posing and critical thinking in environmental adult education today.

5.1.2 Five Steps of Problem-posing and Critical Thinking in Dialogue Education

Auerbach (1992), has simplified the steps of problem-posing which can effectively be used in dialogue education to ensure environmental sustainability among illiterates in rural communities. Problem-posing is a means for facilitating critical thinking skills, and many adult learners need the initial structure these steps provide in order to build confidence and esteem in their ability to think critically. The model of fostering dialogue education is the spiral model, mentioned in the writings of Arnold *et. al.*, (1991). Using this model, a facilitator goes through the following process when implementing a dialogue education activity with a group: (1) the educator starts by asking participants to freely talk about experiences in their everyday lives; (2) deepen the analysis by working with them to make connections among their experiences; (3) when appropriate, introduce outside information to supplement their own knowledge; (4) practice skills and plan for action; and (5) take action, and return again to reflection. It must be mentioned that the facilitator's task is to understand the phase in the spiral model that fits a group's present phase of development, then to find an appropriate participatory group exercise that addresses that phase. This task is fairly easy to organize even among illiterate adults.

Below is a diagram of the spiral model that can be used in dialogue education. The spiral model suggests that learning begins with the experience and knowledge of participants. After participants have shared their experience (whether it be prior experience or the participants' experience from the activity at hand), they can look for patterns and analyze that experience. New information and theory can be collectively created (through facilitated discussion), or added by outside resource people. Once an issue or problem has been analyzed, it is important to practise new skills, strategize and plan for action so that the analysis is not passive. The spiral model emphasizes reflecting on experience and incorporating new information in action.

Figure 7: How to use the spiral model in dialogue education



Source: adapted from the writings of Freire (1973), Arnold *et. al.*, (1991) and Auerbach (1992).

Dialogue education then is a process, continually moving through the cycles to gain better understanding and more effective action. When using dialogue education it is important to keep the principles in mind, as it is the goals of dialogue education and not simply “experiential” activities that empower.

When beginning to problem-pose, it is important for the adult educator or facilitator to spend time on each step, for these are all essential components in learning how to critically think about one's world.

• **Describe the content**

The educator presents the adult learners or students with a code or theme. Codes are a vital aspect of problem-posing. They must originate from the students' concerns and experiences, which make them important to the students and their daily lives. According to Wallerstein (1983 cited in Auerbach, 1992), codes can be written dialogues, taken from a variety of reading materials, that directly pertain to the problem being posed, role-plays adapted from written or oral dialogues, stories taken from the participants' lives and real experiences, text from newspapers, magazines, community leaflets, signs, school bulletins, pictures, slides, photographs, drawings, photo-stories, radio stories or cartoons. After the students have studied the code, the adult educator begins by asking questions, such as: What do you see in the picture (photograph, drawing, etc)? What is happening in

the picture (photograph, drawing, etc)? or What is this dialogue (story, article, message) about? What is happening in the dialogue (story, article, message, photo-story)?

- ***Define the problem***

The students or adult learners uncover the issue(s) or problem(s) in the code. A facilitator may need to repeat the following questions: What is happening in the picture (photograph, drawing, etc)? What is happening in the dialogue (story, article, message)? Students may identify more than one problem. If this occurs, the educator should ask the students to focus on just one problem (especially with beginning problem-posers), using the other problem(s) for a future problem-posing idea. Students may identify two problems or issues that cannot be separated and must be dealt with together. This, too, is acceptable just as long as it is the students' decision to work with the two problems together.

- ***Personalize the problem***

At this point, the adult educator becomes the facilitator of the dialogue, thus guiding the students to talk about how this problem or challenge makes them feel and what the problem makes them think about, so that they can internalize the problem. Through dialoguing, the students will relate the issue(s) or problem(s) to their own lives and cultures. The facilitator should assure that all students are given the chance to share their experiences, understanding as well as be given a choice not to share if unwilling. No one should be made to speak if she/he does not feel comfortable doing so. Learning that others have been in similar situations is very important; this experience will serve as an affirmation to their experiences, lives, and cultures; as an esteem builder; and as a means for bonding with other learners and the facilitator.

- ***Discuss the problem***

The facilitator guides the students towards a dialogue on the social/economic reasons for the problem by asking them to talk about why there is a problem and how it has affected them. During this step, it is critical for the facilitator not to expound upon personal and political beliefs. This temptation may be very strong during a problem-posing dialogue, but resistance to do so is absolutely vital to the growth of the students. Because students' beliefs may differ greatly from those of the facilitator's, students will be more apt to take

risks and openly share their beliefs if they believe that this is their dialogue and they have ownership in its process.

- ***Discuss alternatives to the problem***

The facilitator should coach the students into suggesting possible solutions to the problem and dialogue the consequences of the various courses of action. Through dialoguing, adult learners or students become aware that they have the answers to their problems, especially when they approach their problems and concerns through a cooperative, group effort. Facilitators need to urge the students to search for several alternatives to the problem or issue at hand; the solutions need to be those that can be achieved.

Problem-posing delves deeply into any issue or problem, demonstrating the extent of its social and personal connections. Problem-posing “focuses on power relations in the classroom, in the institution, in the formation of standard canons of knowledge, and in society at large” (Shor, 1992: 31). It challenges the relationship between the educator and the student and offers students a forum for validating their life experiences, their cultures, and their personal knowledge of how their world works. Problem-posing is dynamic, participatory, and empowering. It is one technique in dialogue education that can be effectively utilized to educate illiterates in our communities, even without going through schooling. Levels of awareness for environmental sustainability as well as participation in environmental sustainability activities can equally be greatly improved through this conscientization offered by dialogue education.

Problem-posing in dialogue education is actually more than a technique that fosters critical thinking; it is a philosophy, a way of thinking about students and their ability to think critically and to reflect analytically on their lives. Lindeman (1947; 1956), one of America's founding fathers of adult education, firmly believed that the responsibility of adult education was to help learners learn how to think analytically and critically; this, too, is the role of problem-posing in dialogue education. Dialogue education encourages cooperation. Cooperation is working together in small groups to accomplish shared goals. Within cooperative activities individuals seek outcomes that are beneficial to themselves and beneficial to all other group members.

What makes cooperative groups in dialogue education work?

In Adult education, group problem-solving can safely be said to be one of the most effective way how adults handle most real-world problems. Cooperative learning in dialogue education also mirrors how adult education facilitators themselves learn. Being able to work cooperatively contributes to an individual's success as a member of the group. Educators may fool themselves if they think well-meaning directives to “work together,” “cooperate,” and “be a team,” will be enough to create cooperative efforts among group members. Placing students/learners in groups and telling them to work together does not in and of itself result in cooperation. Not all groups are cooperative. Sitting in groups, for example, can result in competition at close quarters or individualistic effort with talking. To structure learning sessions so that students/learners and educators do in fact work cooperatively with each other requires an understanding of the components that make cooperation work. Mastering the essential components of cooperation allows educators or facilitators to:

1. take existing lesson plans, curricula, and courses and structure them cooperatively;
2. tailor cooperative learning sessions to meet the unique instructional circumstances and needs of the curricula, subject areas, and above all – students; and
3. diagnose the problems some students may have in working together and intervene to increase the effectiveness of the student learning groups.

Systematically, structuring those basic elements into group learning situations helps ensure cooperative efforts and enables the disciplined implementation of cooperative learning for long-term success.

The first and most important element in structuring cooperative learning is positive interdependence. Positive interdependence is successfully structured when group members perceive that they are linked with each other in a way that one cannot succeed unless everyone succeeds. Group goals and tasks, therefore, must be designed and communicated to students in ways that make them believe they swim or sink together. When positive interdependence is solidly structured, it highlights that (a) each group member's efforts are required and indispensable for group success and (b) each group

member has a unique contribution to make to the joint effort because of his or her resources and/or role and task responsibilities in line with group dynamics. Doing so creates a commitment to the success of group members as well as one's own and is the heart of cooperative learning. If there is no positive interdependence, there is no cooperation.

The second basic element of cooperative learning is promoting interaction, preferably face-to-face, critical in dialogue education. Students need to do real work together in which they promote each other's success by sharing resources and helping, supporting, encouraging, and applauding each other's efforts to achieve goals. There are important cognitive activities and interpersonal dynamics that can only occur when students promote each other's learning. This includes orally explaining how to solve problems, sharing one's knowledge with others, checking for understanding, discussing concepts being learned, and connecting present with past learning. Each of those activities can be structured into group task directions and procedures. Doing so helps ensure that cooperative learning groups are both an academic support system (every student has someone who is committed to helping him or her learn) and a personal support system (every student has someone who is committed to him or her as a person). It is through promoting each other's learning face-to-face that members become personally committed to each other as well as to their mutual goals.

The third basic element of cooperative learning is individual and group accountability. Two levels of accountability must be structured into cooperative lessons. The group must be accountable for achieving its goals and each member must be accountable for contributing his or her share of the work. Individual accountability exists when the performance of each individual is assessed and the results are given back to the group and the individual in order to ascertain who needs more assistance, support, and encouragement in learning. The purpose of cooperative learning groups is to make each member a stronger individual in his or her own right. Students learn together so that they subsequently can gain greater individual competency.

The fourth basic element of cooperative learning is helping students learn the required interpersonal and small group skills. Cooperative learning is inherently more complex than competitive or individualistic learning because learners have to engage simultaneously in task work (learning academic subject matter) and teamwork (functioning effectively as a group). Social skills for effective cooperative work do not magically appear when cooperative lessons are employed. Instead, social skills must be facilitated to students just as purposefully and precisely as academic skills. Leadership, decision-making, trust-building, communication, and conflict-management skills empower students to manage both teamwork and task work successfully. Since cooperation and conflict are inherently related (see Johnson and Johnson, 1994), the procedures and skills for managing conflicts constructively are especially important for the long-term success of learning groups. Procedures and strategies for facilitating teaching adult learners or students social skills may be found in detail in Johnson (1993) and Johnson and Johnson (1989; 1994).

The fifth basic element of cooperative learning is group processing. Group processing exists when group members discuss how well they are achieving their goals and maintaining effective working relationships. Groups need to describe what member actions are helpful and unhelpful and make decisions about what behaviours to continue or change. Continuous improvement of the processes of learning results from the careful analysis of how members are working together and determining how group effectiveness can be enhanced. Learning can, thus, be seen as a form of self-actualization, it contributes to socio-psychological health (Sahakian, 1984 cited in Merriam and Caffarella 1998). This element of cooperation in dialogue education tallies with adult education's concern with helping adult people understand their experience, and foster self-actualization.

Dialogue education triggers cooperation in groups, communities and the world as a whole. Cooperation in life helps people achieve self-actualization. Self-actualizers are able to submit to social regulation without losing their own integrity or personal independence; that is they may follow a social norm without their horizons being bounded in the sense that they fail to see or consider other possibilities. Self-actualization is the highest need in Abraham Maslow's Hierarchy of Needs theory (Maslow, 1943).

Self-actualization brings people contentment and happiness. Self-actualization comes easily to cooperators and with difficulty to competitors. Cooperators may affect not only their own lives but also the lives of their family members and community; they have a positive impact on the world. As the anthropologist and educator Margaret Mead cheers us on “never doubt that a small group of thoughtful, committed citizens can change the world for better. Indeed, it is the only thing that ever has” (Freeman, 1999: 6).

As adult educators, we should facilitate programmes and activities for our adult clients so that they become cooperators through dialogue education. Make life better for yourself, as you engage in dialogue education, as well as for the world of adult learners. Do what you love; serve others. Reach self-actualization. This is the thrust of adult education. Adult education aims at helping adults learn to learn to achieve self-actualization by unlocking their potential and attaining their goals. Some of the characteristics of a person that is self-actualized are reality-centered, emotionally well adjusted and strong ethics. These are what you get in cooperators, those who actively participate in dialogue education. We need to cultivate a spirit of living in peace with ourselves, our neighbours, associates and colleagues as well as the natural environment on which humanity is enormously dependent. Men and women should work cooperatively. If we are to save life on this planet Earth and achieve self-actualization, we must unite the heart and the mind, feelings and thoughts, intuition and sensation in each one of us. This is what we may also call participatory education. The goal of participatory education is to help groups of people learn to use reflections on their everyday experiences to analyze the social-political context in which they live, and to develop a sense that they can work effectively to change that context. Dialogue education does just this in communities.

5.1.3 Resident adults’ responses to how illiterates and semi-literates learn about environmental sustainability

The focus group discussions and in-depth interviews with resident adults in “Showground” and “Kakweŵa-Lusowe watershed” communities of Petauke revealed that most illiterate and semi-literate adults learnt about environmental sustainability through informal education. FGDs and interviews revealed that slightly more than fifty per cent of the respondents learnt through dialoguing with family members, friends, neighbours

and associates they interact with. Some said they learnt through radio, television and drama. Two mentioned posters and only one mentioned the Internet as sources of their education on environmental sustainability. Responses from the questionnaire portrayed a similar picture. The study revealed that 66.7 per cent of the respondents indicated that they learnt through sharing Traditional Environmental Knowledge (TEK) with immediate family members, relatives, neighbours, friends and colleagues. The study also showed that 16.7 per cent of the respondents indicated that illiterates and semi-literate adults in Petauke learnt about environmental sustainability through the mass media such as radio and television (especially those in “Showground” compound, Chibisa and Chilenga villages at Petauke Turn-off who are privileged with the ZNBC TV signal). The study further revealed that field demonstrations by extension workers and drama, dance and song only contributed to the education of 8.3 per cent each as ways through which illiterates learnt about environmental sustainability (see Table 11 in Chapter Four).

TEK is generated by communities, over time, to allow them to understand and cope with their particular agro-ecological and socio-economic environment. Such knowledge - referred to as “local,” “indigenous,” or “traditional” - can be termed science, because it is generated and transformed through a systematic process of observation, experimentation, and adaptation. For thousands of years, indigenous peoples around the world have used knowledge of their local environment to sustain themselves and to maintain their cultural identity. TEK is accumulated through trial and error and purposeful observation. Personal experience is the primary source of new information, but revelation and spiritual insight are also recognized sources. The integrity of information and knowledge is derived from the personage of the holder of that information and knowledge, rather than from adherence to a suite of protocols and procedures employed, as in Western experimentation, to obtain that information. As Sherry and Myers (2002) put it, there is no separate educational stream for TEK because TEK systems fully integrate all aspects of culture. As a consequence, no hierarchy of information or knowledge exists and all members of the community contribute to TEK. Elders are, however, generally considered to have greater wisdom and perhaps greater knowledge, but not necessarily more or better information. Greatest credibility is given to the observations and views of individuals who are considered by the community to have the greatest knowledge and understanding

of the item under consideration. Communication is the most fundamental aspect of knowledge sharing. In societies with high illiteracy rate, a discussion of the issues raised within the community can serve as a suitable platform from which to initiate dialogue. As alluded to earlier in chapter two, mutual understanding, respect, honesty, trust, and shared goals are the foundations for overcoming barriers in dialogue education. Environmental adult educators and resource managers or extension workers should work through the community to establish and achieve a meaningful dialogue. The entire community must be embraced because of the inclusiveness of TEK. Paradoxically, adult educators and other community development agents must seek out the holders of TEK because not all indigenous people embrace TEK systems. Input from the community, and especially elders, is pivotal in this regard. To illustrate, reporting on TEK among the Dene in northern Canada, Johnson (1992) indicated that indigenous groups all over the world have adapted cultural belief systems that demonstrate an immense knowledge and respect for the Earth.

Traditional knowledge of the Earth is based on thousands of years experience and cannot be left out of the formula for environmental management. There is so much we can learn from indigenous peoples and as educators devise plans with communities for regulation and restoration of traditional knowledge that provides guidance and solutions. Taboos, as documented in several studies such as Phukan (2005) and PACODEV (2004) also act as a social device in the management of natural resources. In the present study area, elders interviewed cited many taboos in the Nsengaland that help conserve environment. Taboos represent unwritten social rules that regulate human behaviour. Such constraints not only may govern human social life, but also may affect, and sometimes even directly manage, many constituents of the local natural environment. Whatever the reason for such constraints, taboos may, at least locally, play a major role for the conservation of natural resources, species, and ecosystems. To illustrate, the *Msolo* tree is considered sacred and maintained for traditional worshipping in Petauke and it is taboo for indigenous people to cut down this tree. Similarly, medicinal plants are often conserved by avoiding uprooting such plants. People tend to simply pick few parts of a tree required for medicine like bark, leaves, flowers, part of a root and allow the tree to grow on. Conservation of

medicinal plants, especially endangered ones depend largely on the conservation of the ecosystem in which they occur.

People interact with their environment through their behaviour. We will use the word “behaviour” in this study to refer to the decisions, practices, and actions of people, both as individuals and in groups. Many behaviours affect natural resources. Individuals at all levels - from subsistence farmers to honey and edible caterpillars collectors, project managers, chiefs and politicians - make decisions and engage in practices that affect natural resources. The behaviour of individuals and social groups forms the interface between ecological systems and social systems. Similar examples occur throughout Africa. Growing irrigated crops, grazing livestock, clearing forests for cultivation, making charcoal for sale, deferring to traditional leaders in land-use decisions, guiding wildlife tourists, maintaining ancestral graves, and avoiding certain areas because of taboos, all affect natural resources in a complex mix of positive and negative ways. These traditional practices somehow resemble the modern or formal strategies adapted for natural resource management (also see Brundtland, 1987). The findings demonstrate the richness and variety of indigenous tree management. Techniques range from simple to highly sophisticated. Many – though not all – indigenous practices are based on thorough ecological knowledge, are environmentally sound, and enable societies to maintain ecological equilibrium with their environment. Besides, its potential for environmental conservation, indigenous tree management can also contribute to the preservation of genetic resources. But indigenous management systems are not merely neutral preservers of genetic information; they may be powerful breeding methods. Management intensity and practices differ among societies and individuals. However, all indigenous tree management systems are complex, making it difficult to change one element without adversely affecting others.

Integrating the values and interests of the diverse actors and stakeholders requires participation from all levels. Poor, rural people often have the most direct interest in the local natural resources base, however, and they are often the most politically and economically marginalized of any stakeholder group, so their active participation is especially important. Local people often have:

- *rights* to local natural resources,
- indigenous, local *knowledge* about how to manage local natural resources sustainably and
- the *power* to implement and sustain natural resources management activities over the long term.

In rural Africa people depend heavily on natural resources for their livelihoods. For those people, sustainable use of natural resources and human well-being are inextricably linked. Local residents often have a tremendous wealth of indigenous knowledge about the natural resources in their environment and about how to manage them sustainably.

It is, therefore, safe to hold the views that environmental adult education needs to include traditional knowledge of local people and has a specific responsibility to revive and promote such traditions. Traditional ecological knowledge is a potentially powerful medium in which to teach environmental education and has the potential for influencing transformative learning in rural communities.

TEK can best be learnt through dialogue education in Third World countries where few people can read and write. Although many educators agree that one of the focuses of environmental adult education is adult transformation, this has not been extensively explored in the context of third world communities' environmental knowledge which is mostly still found among the elder members of these communities. Specifically, there has been very little work done in immersion courses where non-indigenous and part-indigenous students and researchers learn from local and indigenous experts. Elders' knowledge is increasingly being seen as the potential foundation stone by which younger generations may cope with an ever more complex world of potential resource scarcity, ecological uncertainty, environmental insecurity, increased state based management of renewable resources, social change and associated social problems within indigenous people's communities due to the multifaceted effects of globalization. Elders' knowledge should be seen as having value in terms of indigenous history, culture and identity. As a result, a number of indigenous peoples organizations, like the Nsenga Cultural Association, have been to the forefront of demands that traditional knowledge be collected, recorded or documented, archived and communicated to younger generations,

preferably by the indigenous people themselves so that in the face of rapid social change, cultural continuity and traditional values may be maintained. It should also be noted that TEK is a “way of life”; rather than just the knowledge of *how* to live, it is the actual *living* of that life. Indigenous people have acquired TEK over generations as a survival strategy. It includes a system of classification, “a set of empirical observations about the local environment, and a system of self-management that governs resource use” (Johnson, 1992: 4). TEK is socially-differentiated according to gender, age, occupation, socio-economic status, religion, and other factors.

- TEK is holistic, with nature being seen as interconnected and interdependent, whereas western capitalist science is often reductionist, and deliberately breaks nature down into its component parts.
- TEK is at the heart of indigenous or aboriginal and local traditional identities and is central to their way of life.
- TEK is rooted deeply in the social and spiritual fabric of society and is often based on reciprocity and equity (e.g., knowledge, and the products resulting from that knowledge, such as mats, bark cloth, fish, medicines to mention but a few) is often shared and reciprocated within a community rather than compartmentalized.

The erosion of biodiversity constitutes an immense cultural loss and women, as bearers of knowledge and as main food producers and caregivers in most Third World communities, have a major stake in the conservation of the basis of their livelihood and that of their families. Throughout the years, indigenous rural men and women have developed different yet complementary knowledge systems, which need to be recognized and valued in the quest for sustainable development.

The present study findings also revealed that some illiterates and semi-literates learn about environmental sustainability through the mass media such as the community radio and television. Petauke has two community radio stations: Petauke Radio Explorers and PASME radio station. They are the mostly used media by chiefs to disseminate their information to their subjects as their transmission cover Petauke, Katete, Nyimba, Mambwe and parts of Mozambique, Serenje and Chipata. In addition, more effective dialogue programmes could be organized by literacy department of Ministry of Education

in collaboration with the department of forestry, Zambia Wildlife Authority (ZAWA), department of agriculture, the local government authority, NGOs and local leaders through community radios to deal with environmental sustainability issues and traditional environmental knowledge shared by listening groups in communities. This is in a way similar to the findings reported by Participatory Community Development (PACODEV) (2004) elsewhere in Africa. PACODEV is a women-led NGO based in Ghana that uses mass media such as video equipment to enable women to devise community plans for natural resource management.

5.2 Levels of Awareness of Environmental Sustainability among Illiterates and Semi-literates Adults in Rural Communities

5.2.1 Local leaders' responses on levels of awareness of environmental sustainability among illiterates in Petauke

The present study revealed that 62.5 per cent of the local leaders were of the view that although the illiterate adults learnt through various informal and non-formal education, they did not participate in environmental sustainability activities and related programmes. Furthermore, 12.5 per cent indicated that they strongly felt illiterate adults did not participate in environmental sustainability activities. The other 12.5 per cent were undecided on the question. Only a small percentage of 12.5 per cent of the respondents were in agreement that the illiterate and semi-literate adults in Petauke district actively participated in activities and programmes directly related to environmental sustainability. These findings are in agreement with those recorded by UNEP (2004) and ECZ (2001) that suggested that there was low level of participation in environmental sustainability in rural Zambian communities.

Further, the study findings showed that the local leaders were of the view that levels of awareness of the need for environmental sustainability among illiterates and semi-literates in Petauke were low. For instance, only 37.5 per cent of the respondents agreed that illiterates were aware of need for environmental sustainability in their communities (see Table 5 in Chapter Four). Twenty-five per cent of the respondents were in disagreement that illiterate adults in Petauke district were aware of the need for environmental sustainability. Moreover, 12.5 per cent of the local leader respondents

strongly did not agree that illiterates were aware of need for environmental sustainability. The other 12.5 per cent were not sure in their responses.

5.2.2 Responses from resident adults on levels of awareness of environmental sustainability

This study revealed that the responses from the local resident adults in Petauke district suggested somewhat worrying low levels of awareness of environmental sustainability. For instance, data in Table 13 in Chapter Four revealed that 75 per cent of the respondents were not aware of the “Make Zambia Clean and Healthy” (MZCH) campaign – more than one year after its official launch by the late republican President Levy Patrick Mwanawasa. Only 25 per cent of the adult respondents in this rural district were aware of the “MZCH” campaign. The “MZCH” campaign has so much to do with environmental sustainability in the country. Besides sanitation issues, the “MZCH” campaign has a lot do with conservation of natural resources like forests. For instance, trees are important, valuable and necessary to our very existence. It’s not too hard to believe that, without trees we humans would not exist on this beautiful planet. Trees give us so many good things. Trees add beauty and colour to an otherwise colourless background. Forests provide a sanctuary for wild animals and birds and, therefore, their destruction entails doom for such animals and birds. Trees have even been a source of inspiration to many artists around the world. They come in all sizes, shapes and colours adding to the amazing variety of flora around us. The study findings revealed that the low awareness of environmental sustainability in Petauke has greatly led to deforestation. Besides agricultural land and infrastructure development, many trees are cut down in Petauke for energy use. This loss of trees has led to loss of some species of plants, animals, birds, reptiles, butterflies and other insects that depend on certain vegetation.

Charcoal production: Globally, the use of woodfuels has been growing in line with population growth, so that the annual growth in demand is between three and four per cent depending on the country (Amous, 2000). Urban women interviewed during household energy surveys in Ethiopia, Chad, Madagascar, Mali, the Niger and Senegal did not like to cook with wood because they found it difficult to kindle, awkward, dangerous for children and smoky (Ibid). They reportedly preferred to use charcoal.

Charcoal is often traditionally made from species that yield a dense, slow-burning charcoal. These species are slow growing and are therefore particularly vulnerable to overexploitation. The contribution of charcoal production to loss of biodiversity in the forest is generally immense in areas near urbanized centres where demand for it is high. The activity seems to provide employment to a lot of youths and adults in our rural areas. Charcoal production, distribution and use as a source of energy unfortunately exhaust well-stocked forests. Many times, truckloads of charcoal or wood were seen on the roads in the study area, with one or more people precariously perched on top of the bags, underlying the extent to which the environment is being depleted.

Interviews with some respondents revealed that some of the charcoal produced in Petauke and other districts in Eastern province, was “exported” to Malawi (probably illegally) where it is in very high demand as its production is totally prohibited by the government to save the remaining few trees in that country. This is similar with what Chidumayo (1991) states that the problems of charcoal production and firewood collection lead to loss of biodiversity and subsequently to desertification, prevalent in areas closer to cities and neighbouring needy countries. The “exportation” of charcoal in Eastern province, if not stopped, will lead to total desertification of the province and increase the levels of poverty even further. However, using dialogue education, environmental adult educators could facilitate critical thinking in communities to come up with alternative renewable cheap source of energy. Henning (1996), reports that biofuel such as *Jatropha* oil is effectively used for cooking and lighting in rural and peri-urban areas of Mali. Dry cow dung can also be an alternative cheap source of energy for cooking purposes when available in large quantities. Moreover, solar energy (from the abundant sun in Africa) could help all our rural areas with cleaner energy supply if the technology could be provided cheaply and affordably. Similarly, Bailis *et al.*, (2005) recommend that there is need for Africa to make a transition to a cleaner alternative source of energy as an alternative such as clean charcoal produced in Brazil, Côte d’Ivoire and Thailand today. These countries produce clean charcoal from sawdust (<http://www.hno.harvard.edu> and Brailis, *et al.*, 2005). Many sawmills produce great amounts of waste, which is often simply burned for disposal or very roughly carbonized. Semi-industrial charcoal making processes with incineration of pyrolysis gases and heat recovery could provide a

satisfactory way of optimizing sawmill by-products. This transition could reduce greenhouse gas emissions by 45-66 per cent (<http://www.hno.harvard.edu>). In their study report, Brailis and associates (2005) observe that the African continent mostly depends on firewood and charcoal for cooking and heating homes, especially among the poor in rural and the peri-urban areas. The report reveals that in 2000, nearly 470 million tonnes of wood were consumed in homes in Sub-saharan Africa in the form of firewood and charcoal, more wood per capita than any region in the world. More than 1.6 million people, primarily women (who usually do the cooking) and children die prematurely each year world-wide (400,000 in Sub-saharan Africa) from respiratory diseases caused by pollution from such fires. The study further estimates that smoke from fires used for cooking will cause about 10 million premature deaths among women and children by 2030 in Africa and release about seven billion tonnes of carbon dioxide in the form of greenhouse gases to the environment by 2050, about six per cent of the expected greenhouse gases from the continent. A pronounced shift from fuelwood and charcoal, especially in Africa, has raised concerns among environmentalists and those responsible for forest development and management. The transition to cleaner source of energy for cooking and heating in Petauke, Zambia and Africa as a whole without drastically increasing pollution and decimating forests would be an excellent way to towards achieving several of the United Nations Millennium Development Goals, among them reducing child mortality, ensuring gender equity, environmental sustainability and to invest in the African continent.

Brick making using firewood in Petauke

In rural areas of Zambia, especially in Eastern province and Petauke district in particular, brick making has significantly contributed to massive degradation of the forest resources. Most of the respondents interviewed and focus group discussion discussants identified brick making as a growing force in forest degradation in the study area. Although the actual estimates of the contribution of this activity to deforestation remains unknown, local forestry officials believe that brick making seems to account for over 10 per cent of forest loss in the district. Field observation in the study revealed that all modern buildings in Petauke town were constructed using burnt pan bricks – houses, hospital, clinic, schools, industries, shops, lodges and guesthouses, all government buildings and offices.

It, therefore, seems that a lot of forest is lost for firewood to burn pan bricks (see Plate 1 in Chapter Four for illustration). Chidumayo (1987), reports that in brick making, firewood is extensively utilized to burn the bricks. For 5,000 bricks about 7m³ of firewood is consumed. Annually, it can be estimated that over ten million bricks are burnt for construction of various infrastructure in the fast growing rural district of Petauke, implying that over 2,000 m³ of firewood is burnt to support this activity. Using dialogue education, public sensitization and a collective decision could be realized to begin using environmental cost-effective soil stabilized interlocking blocks promoted by the UNZA's Technology Development and Advisory Unit (TDAU) for construction of buildings in the district. This move could save a lot of trees and positively contribute to environmental sustainability.

It seems from these findings that the prospects of achieving the MDGs on ensuring environmental sustainability in Petauke, Zambia by the target year 2015 remain bleak. This position is further supported by ECZ (2001) and UNEP (2004) who state that Zambia may not be able to attain the MDGs number seven on ensuring environmental sustainability unless the citizenry increased their levels of awareness. Moreover, the citizenry must actively participate in environmental sustainability programmes including decision-making, implementation and evaluation of activities in their communities. Positive and friendly attitudes in life attract dialogue while negative ones can be repulsive. Adult education can play a critical role in facilitating dialogue education to foster environmental sustainability awareness and dissemination of information and knowledge.

Increasing awareness and participation in environmental sustainability can enormously help Petauke community and our country in general achieve sustainable development for all. Sustainable development is a very simple idea that is about ensuring a better quality of life for everyone, now and for future generations to come. Sustainable development is all about recognizing that economic, social and environmental goals cannot be pursued independently. Focus on just one area can lead to negative impacts on the others, or at very least missed opportunities. It means meeting development that takes into consideration:

- social progress which recognizes the needs of everyone;
- effective protection of the environment; and
- prudent use of natural resources.

Sustainable development requires significant changes in the mind-set whether it is about changing the way goods are produced and consumed, the way we set our political and social priorities, or about the way we sense the dangers to the planet's ecosystem. In other words, sustainable development is about learning to make better decisions cooperatively through dialogue than we have made it in the past.

5.3 Room for Additional Approaches to Curb Environmental Degradation

The study findings reveal that 66.7 per cent of the adult respondents were of the view that there was room for additional approaches to curb environmental degradation in Petauke district. This is in line with utilization of critical theory and transformational learning theory in communities even among illiterates. Only 33.3 per cent of the respondents were somehow pessimistic that the environmental chaos was an irreversible human action and there was no room for additional approaches to curb environmental degradation. These findings are presented in Table 16 of Chapter Four. Field observations and interviews also showed efforts being made to reverse deforestation in communities. However, more collaborated continuously partnership active participation efforts of stakeholders are still needed to mitigate environmental degradation

Poverty reduction is only possible if the environment is able to provide the services people depend on, and if natural resources are used in a manner that does not undermine long-term development. African countries' ever increase population demands creative efforts to find new ways of producing more food from the country's finite resources. African governments should link biodiversity conservation with policies on overcoming poverty, especially in local communities that live around protected areas and in zones richly endowed with biodiversity, through the sustainable use of the resources.

Environmental adult education should facilitate advocacy and public awareness activities that emphasize the importance of biodiversity for agriculture, food security, nutrition, sanitation, tourism and rural livelihoods, and especially for those populations living in

marginal and harsh environments. Dialogue education can play a critical role in this strive for sustainable development.

In addition, environmental adult education should facilitate to:

- promote new and traditional approaches to increasing food production without losing on-farm biodiversity;
- develop capacity and learning process to allow local communities to influence the formulation of national and international plans and policies; and
- disseminate best practices and available technologies among community based organizations (CBOs), NGOs and other stakeholders.

Forests play a crucial role in the economies of many African countries, providing timber and industrial material as well as contributing to tourism, recreation and cottage industry. Tropical forests also help regulate global climate through the absorption of carbon dioxide. Deforestation and forest degradation continue to occur in the region due to a variety of causes, including demographic pressures, poverty, production and consumption patterns, land tenure patterns and land speculation. Other important factors that contribute to deforestation and forest degradation include, illegal logging, grazing pressures, illegal cultivation, the demand for fuelwood and charcoal, refugee-related problems, oil and mining exploitation, natural climatic events and forest fires. Food and Agriculture Organization (FAO) (2001)'s data indicate that the annual rate of deforestation in Africa was 0.7 per cent between 1990 and 1995, with the highest rates being recorded in the moist western parts of the continent. The data also indicate that the rate of afforestation is far less than that of deforestation.

In Africa, there are many ingenious and effective ways through which indigenous and other local communities are rising to these challenges. Unfortunately, their innovations remain largely unknown. Whether for food, medicine, or income generation, these groups are using their biological resources in a sustainable way to improve livelihoods. Environmental adult education programmes will empower local communities and non-governmental organizations to promote local initiatives for natural resource management, which involve for example tree planting, nurseries development, and other means of

generating income that do not harm wildlife or the environment. Communities sustainable development programmes should focus on activities that conserve and protect the local environment and that contribute to alleviate poverty (e.g., activities that increase natural resource base for food security, that generate income through sustainable use of resources, or that can promote healthy status of the poor such as water and nutrition to mention but a few).

5.3.1 Conservation farming and environmental sustainability

The present study revealed that a number of respondents in the study area were of the view that many people practice conservation farming as a way of contributing towards environmental sustainability. Field observation showed that conservation farming in Petauke is often practised side by side with organic farming, mainly because many of the small scale farmers (smallholders) cannot afford chemical fertilizers for their crops. This is similar to reports by the Zambia National Farmers Union that in many respects the practices of conservation farming *are* moving closer to organic farming (Conservation Farming Unit (CFU), 1997).

At the heart of organic farming is a philosophy which aims to enhance and work with natural biological cycles. It aims at co-existence with “nature”, rather than dominance over nature. Certain similarities between conservation farming and organic farming can be identified. Both are part of sustainable agriculture, produce similar crops, usually practice intercropping, often using the same machinery. Both retain stubble and aim to prevent soil damage, enhance soil condition using crop rotation, organic manure and ensure the productivity of the system.

Many smallholders in Sub-Saharan Africa are faced with problems of recurrent droughts, loss of rain water due to runoff, erosion and degradation of soils. Conservation farming is now seen by many as one of the solutions to these devastating problems. For optimum tillage, planting and crop management systems to be developed, promoted and subsequently adopted, it is essential for researchers, extension workers and other development agents to understand the constraints within which individual farmers operate.

The benefits of conservation farming

The benefits of conservation farming are proven and offer smallholders the opportunity to increase their productivity, safeguard the land and reduce the risks of total crop failure in drought years. Sustainable agriculture means a series of farming operations that can take care of the “whole” system in such a manner that farming can be sustained over a long period of time, generation after generation.

CFU (1997), reports that it is now commonly agreed in Zambia that conservation farming systems provide the best opportunity for farmers to reduce their costs, increase their productivity, ameliorate the effects of drought, improve their food security and income, and protect the agricultural resource base from further degradation – hence, positively contributing to environmental sustainability. Dialogue education can help spread the use of conservation farming in Petauke district where the majority of the population’s livelihood is centered on agriculture. Conservation farming, especially when incorporated with agro-forestry of multipurpose tree species such as *Moringa*, *Jatropha* and *Luceana* found in Petauke, could enhance food security and increase income to enable farmers spend part of it on educating their children in the study area. Furthermore, when the practice reaches a large scale, it would encourage tourists from both within Zambia and abroad to witness the success story of how conservation farming positively contributes to environmental sustainability. These tourists could bring more money to the district, helping the district develop even further.

5.3.2 NGOs in Zambia that offer alternative ways to conserve natural environment through community based natural resource management

Community based natural resource management in Zambia is mostly initiated and organized by NGOs in close collaboration with various government ministries or departments. One such NGO is the Green Living Movement (GLM), a Zambian non-governmental organization committed to ensuring environmental protection, sustainable rural development and to eradicating all forms of poverty. Another prominent one is the Wildlife and Environmental Conservation Society of Zambia (WCS) whose mission is to spearhead environmental awareness at all levels of the community, promote the wise use of natural resources and to become the most effective independent environmental action

group in Zambia. The WCS in Zambia has a history of over twenty- five years in pioneering new approaches to conservation in close collaboration with the Zambian government.

Conservation in Zambia requires collaborated innovative solutions to help communities become better custodians of their land. Such solutions require a results-oriented approach that is non-capitalist, science-based and stakeholder-driven incorporating TEK. An approach such as what WCS has applied to Luangwa valley. The conservation model emerging from this work in Zambia builds stable and prosperous trading relationships with rural communities in exchange for learning and applying better farming and land use practices that lowers the level of threats to wildlife and habitat. Similarly, field observations in the present study revealed that in Petauke, one local non-governmental organization that seems so committed to helping educate communities in environmental sustainability awareness is the Petauke Community Forests (PCF). The work of PCF is being driven by Garry Brooks, a retired businessman from Victoria, BC. He is working with the traditional leaders and communities to do their part in meeting the challenges of everyday life as well as providing education on reforestation, global warming and climate change. He has spent the last five years volunteering at village level as a community developer (see <http://www.africancommunityproject.com>). PCF's activities cover 100s of Square kilometres of the once forested lands in chiefdoms of the district. The NGO has been facilitating the planting of trees in the area for the past four years working with community schools that are located in the once forested lands. Records at the district forestry department and the NGO's offices showed that PCF has initiated projects in nearly 50 community schools and over 10,000 students attending classes in those schools that are funded and organized by the community (see <http://lushcharitypot.blogspot.com/2008/10/petauke-community-forests.html>). The main objective of PFC is to educate both the children and their parents and guardians the need to preserve and reforest the once vast forest that sustained their forefathers and how the environment does affect their daily lives. It seems this will empower the people to take control of their environment as well as help communities achieve sustainable lifestyles from agro-forestry incorporated in their agricultural system and livelihood in general.

PCF collaborates with the departments of forestry, agriculture and water affairs and encourages open dialogue to mitigate environmental degradation such as organized dialogues with communities on the reasons for water shortages and the environmental changes that are affecting their lifestyles. The planting of trees for reforestation, food, heat for cooking and an income are done at village level with an impact that will be felt by the coming generations. This communication and exercise is done through the local community schools. Environmental education is provided by PCF coordinators visiting the schools and surrounding communities. Seeds for various tree crops are provided and instruction on planting and care are taught. By 2008, *Moringa* trees planted in 2004 were already being used in seed collection (reforestation) and health products. Other crosscutting issues facing the communities were also dealt with by the NGO; these included malaria and HIV and AIDS prevention, women's and children's rights and safe drinking water. A new hand dug wells have been dug for a village of 350 people that until then relied on water from a waterhole shared with the local animals. Five wells were rehabilitated and dug deeper supplying much needed water to desperate villagers. Most importantly, trees were planted in community schools throughout the deforested lands. Many indigenous trees were planted along with *Moringa* for food, water purification and medicine, *Leucaena* for general wood supply, firewood and charcoal and *Jatropha* for the making of soaps and biofuel among other functions. All three species are fast growing and are drought resistant. Records revealed that over two million seeds were given directly to the community schools and communities surrounding the schools and were planted during 2007-2008 rainy season. More such community effort is required in the district to curb environmental degradation caused mainly by deforestation.

With deforestation, water shortages and lack of clean drinking water in the district, local leaders and most residents interviewed were delighted that PCF was encouraging planting and protection of *Moringa*, *Jatropha* and other trees in the district. *Moringa* and *Jatropha* are often referred to as wonder trees by many authors like Duke (1982, 1983), Fuglie (1999), Fahey (2005), and Henning (undated; 1996) because of their numerous functions in rural communities. These trees will greatly help with reforestation in Petauke. Forests

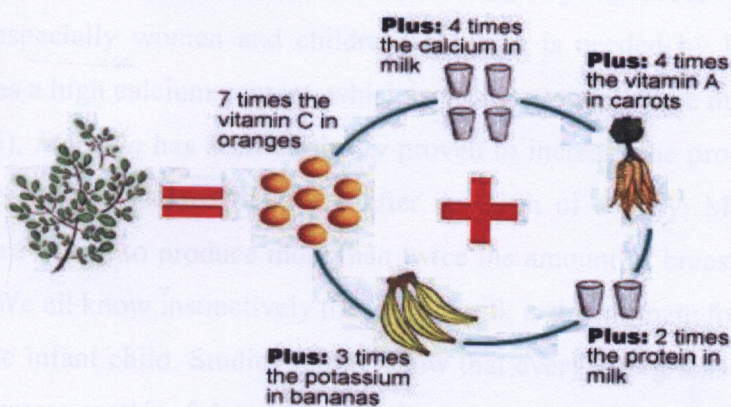
produce benefits that can be taken for granted when it seems like the tree supply is endless: clean water and air, variety of wildlife, fertile soil, energy, construction materials, medicine, and non-timber products like fruit, caterpillars, honey, mushroom, natural vegetables, etc., that would otherwise be unaffordable to the rural poor.

5.3.3 *Moringa* tree planting in Petauke

The present study revealed that *Moringa* was being promoted and grown in Petauke. There are 13 varieties of *Moringa*, *Moringa oleifera* is the most well known (Duke, 1982). Studies have shown that *Moringa* leaves are very nutritious and have been used to mitigate malnutrition in many parts of the world like India, Brazil, Zimbabwe and Senegal (Fuglie, 1999; <http://www.unesco.org/most/bpik10-2.htm>). *Moringa* is a tropical multipurpose tree. It is resistant to drought and fast growing. *Moringa* is raising a growing international interest among NGOs, scientists and the private sector, as a source of food supplement, flocculent for water treatment, cosmetic oil, medicinal values, vegetable and livestock fodder.

Fahey (2005) supports that *Moringa* is the most nutrient-rich plant ever discovered. Gram for gram, *Moringa* fresh leaves contain seven times the vitamin C in oranges, four times the vitamin A in carrots, four times the calcium in milk, two times the proteins in milk and three times the potassium in bananas. This can be illustrated in diagram form as shown in Figure 7.

Figure 8: Multiple attributes of nutrient-rich *Moringa* fresh leaves



Source: Adapted from Fuglie (2000), Fahey (2005) and <http://www.unesco.org/most/bpik10-2.htm>.

A large number of reports on the nutritional qualities of *Moringa* now exist in both the scientific and the popular literature. In fact, the nutritional properties of *Moringa* are now so well known that there seems to be little doubt of the substantial health benefit to be realized by consumption of *Moringa* leaf powder in situations where starvation is imminent. Fahey (2005), reports that dried *Moringa* leaves contain about 10 times the Vitamin A of carrots, seventeen times the calcium of milk, twenty-five times the iron of spinach, half the Vitamin C of oranges, nine times the protein of yogurt and fifteen times the potassium of bananas,' and that the protein quality of *Moringa* leaves rivals that of milk and eggs. Fuglie (1999), reports that *Moringa* leaves could practically wipe out malnutrition on our planet. Nutrition experts agree that the long-term solution to malnutrition is the use of foods rich in the essential nutrients often lacking in people's diets. Malnutrition causes high infant mortality and a staggering array of health problems and afflicts approximately one billion people in the world (FAO, 2001).

Modern scientific research is proving that *Moringa* leaves are one of the richest sources of such nutrients. Even small amounts of the leaves could protect thousands of people from suffering and death (Fuglie, 2000; Fehey, 2005). People in several countries have found that *Moringa* leaves are quite acceptable to taste, especially when added to common foods. *Moringa* is especially promising as a food source in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce in Petauke and other rural places in Zambia. *Moringa* is a vegetable tree often ignored by many people in Zambia yet it can help boost government effort to fight hunger and poverty, as well as chronic malnutrition suffered by hundreds of thousands of Zambians, especially women and children. *Moringa* is needed by lactating mothers because it has a high calcium content, which is necessary to produce milk. According to Fehey (2005), *Moringa* has been clinically proven to increase the production of breast milk whether it is consumed before or after the birth of a baby. Mothers who took *Moringa* were shown to produce more than twice the amount of breast milk than those who didn't. We all know instinctively that breast milk is the ultimate food prescribed by nature for the infant child. Studies further show that every 100 grams of *Moringa* pod contain 2.5 grams protein, 0.1 grams fat, 8.5 grams carbohydrate, 4.8 grams fibre, and

minerals such as Calcium (30 milligrams), Phosphorus (110 milligrams), and Iron (5.3 milligrams).

Fahey (2005), reports that leaves (per 100 grams) contain 7.5 grams water, 6.7 grams protein, 1.7 g fat, 14.3 g total carbohydrate, 0.9 grams fibre, 2.3 grams ash, and minerals, Calcium (440 mg), Phosphorus (70 mg), Iron (7 mg), Copper (110 mg), Vitamin A, and Vitamin C (Ibid). The leaves also contain different amino acids and estrogenic substances, including the anti-tumor compound, sitosterol, and a pectinesterase. Water, protein and fibre can also be found in the seed kernel (70.74 per cent of seed). The seed oil contains 9.3 per cent palmitic, 7.4 per cent stearic, 8.6 per cent behenic, and 65.7 per cent oleic acids among the fatty acids. *Moringa* contains the phytochemical niaziminin, which is found to have molecular components that can prevent the development of cancer cells (Fuglie, 1999).

Moringa is the only plant that contains all the essential amino acids our body needs but does not make (Fuglie, 2000; Fahey, 2005). Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value. *Moringa* is especially promising as a food source in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce.

Every part of this tree is edible, from the leaves, trunks, stems, all the way down to its roots. The flowers can be eaten or used to make tea and provide good amounts of both calcium and potassium. The young pods can be cooked and reportedly have a taste reminiscent of asparagus. The green peas and surrounding white material can be removed from larger pods and cooked in various ways. It is for this reason that Fuglie (1999), Fahey (2005) and others hold it that *Moringa* trees have great potential in combating extreme poverty and hunger. The nutritious leaves grow quickly, in many different environment types, and can feed people, as well as livestock and sanctuary animals within three months after planting. Surprisingly, the leaves contain complete proteins, which is rare for a plant. *Moringa* leaf powder is very easy to produce using common household items, can be added to many food items and provides a concentrated source of

several macro and micro elements including protein. *Moringa* is one of the rare plant sources of complete protein (containing all 9 essential amino acids), calcium, iron, Potassium, magnesium and many Vitamins including A, C, E and the B Vitamins. It is a super-charged boost to the immune system! And in many Third World countries, *Moringa* is used as a micro nutrient powder to aid indigenous diseases. Senegal and the Democratic Republic of Congo (DRC) are good examples. The oral histories recorded by Lowell Fuglie in Senegal and throughout West Africa report countless instances of lifesaving nutritional rescue that are attributed to *Moringa* (Fuglie, 1999; 2000).

To produce *Moringa* leaf powder at household level in a village or urban area, one has to wash fresh picked leaves, spread them on a clean cloth inside a house or any area protected from light and let them dry in the shade. Direct sunlight reduces the value of vitamins in the leaves. The leaves should be free from dust. If necessary, leaves can be covered by a thin cloth or mosquito netting to help them keep clean while drying. The drying process takes two to five days in the dry season and up to a week in the rainy season. Pound the dry leaves using mortar and pestle or local grain grinder and then sieve to fine powder. The powder can be stored best in an air-tight container for use when required (Fuglie, 1999; 2000). Every household in the tropics can process this excellent *Moringa* leaf powder nutritional supplement which can be added to any dish or beverage. For healthy individuals, a few spoonfuls of the powder can be added to any meal to make it more nutritious. Since the nutrient content decreases with heat, add the powder after the food or drink has been prepared, just before serving.

In the neighbouring DRC, one *Moringa* Tree Project (MTP) was launched in Tshikaji in May 2004 and promotes the use of *Moringa* leaf powder (or fresh cooked leaves) as a nutritional supplement used in both the prevention and treatment of malnutrition and anemia. (see details on http://www.bspc.org/images/reports/TSHIKAJI_MORINGA_MALNUTRITION_PROJECT_wo_table_2_pg.pdf). As already alluded to, *Moringa* powder is very easy to produce using common household items, can be added to many food items and provides a concentrated source of several macro and micro elements. The iron compound found in *Moringa* helps restore red blood cells and builds and maintains blood supply. As an excellent source of calcium, *Moringa* helps in keeping up health

teeth and bones. As a source of vitamin A, *Moringa* keeps the body healthy and prevents xerophthalmia. Xerophthalmia is an eye disorder characterized by dry and lusterless eyeballs. *Moringa* also improves your night vision in addition to increasing your body resistance to diseases. Fahey (2005), reports that for a child aged one to three years, one rounded tablespoon added to the child's diet three times a day provides 42 per cent of the RDA for protein, 75 per cent RDA for iron, 125 per cent RDA for calcium and 272 per cent RDA for Vitamin A. Pregnant or lactating women should consume six rounded tablespoons (50g) of *Moringa* leaf powder per day. *Moringa* can be used to fortify noodles, soup or bread with vitamins and minerals of the nutritious vegetables. As *Moringa* leaves are a rich source of many nutrients and therapeutic elements, including anti-inflammatory, antibiotic and immune enhancing properties, it is being promoted as an important nutritional supportive therapy for those living with HIV and AIDS and other immune-suppressed individuals.

The Tshikaji Moringa Tree Project (TMTP) is sustainable (each tree producing thousands of seeds for tree multiplication), community-based and includes many exciting activities all made possible through the efforts of a Congolese agronomist coordinator, a nurse nutritionist and eight village *Moringa* volunteers. Since 2004, "team *Moringa*" has provided over 250 educational awareness sessions, trained over 150 *Moringa* community volunteers and distributed over 50,000 informational brochures to pastors and church groups, local leaders, health professionals, local businesses, schools, women's groups and agricultural workers. More than 10,000 tree seedlings and countless numbers of seeds have been distributed and planted in family gardens in Tshikaji and in over 100 additional villages in the surrounding region and at all the Congo Presbyterian Church (CPC) mission hospitals. The results of local research reveal that the malnourished children respond faster to treatment when *Moringa* is added to their diet and are free from infections and diarrhea during their recovery to health. Today, many village mothers throughout Congo are harvesting leaves from their family *Moringa* trees and manufacturing *Moringa* leaf powder at home to be added to their household daily diet with amazing improvements seen in the health status of the entire family. In 2007, three years after introducing *Moringa* to the village of Tshikaji, the rate of moderate-severe

malnutrition in children under age five had decreased from 30.5 per cent to less than 10 per cent (Ibid).

The *Moringa oleifera* tree can be found throughout the world in the tropics and subtropics although it originates from northern India. Its edible fruit and leaves are a feature of diets in India, the Philippines, Senegal, Niger, Ethiopia, Zimbabwe district and many other countries (Fuglie, 2000). The plant can also reduce malnutrition common in Petauke and Zambia as a whole. The Southern African Regional Poverty Network (SARPN) revealed that United Nations International Children's Fund (UNICEF) reports that the levels of child malnutrition in Zambia were showing steady improvement throughout the 1990s but since 1999 they have deteriorated quite significantly from 25 per cent underweight in 1999 to 31 per cent in 2002 (<http://www.sarpn.org.za>). Meanwhile, the 2007 Zambia Demographic and Healthy Survey (ZDHS) conducted by Zambia Statistical Office disclosed that 45 per cent of children under that age of five were stunted, while 21 per cent were severely stunted (*The Post*, 2009). This is likely due to a combination of poverty, drought in some parts of the country, flooding because of devastating rains and the impact of HIV and AIDS on child malnutrition. Using dialogue education, each household can critically reflect and consider planting a few *Moringa* trees even as part of their house fence. The tree is reported to live for up to 20 years still producing nutritious leaves and bearing fruits (Fahey, 2005). Thereafter, it can again be trimmed to a height of one to two metres to regenerate in the rainy season.

***Moringa* parts as natural medicine**

Around the world every part of the *Moringa* tree has been used effectively against varying ailments. Some of the remedies are described here but there is no guarantee they will work for every case! *Moringa* has a long history in medicine. *Ayurveda*, in particular, has used *Moringa* as a source of vitamin C, and to treat colds, boils, fever, joint pain, hypertension and even gout. *Ayurvedic* medicine uses *Moringa* leaves to prevent 300 diseases and local herbalists make extensive use of *Moringa* products to treat a host of ailments, including diabetes, ulcers, toothache, high blood pressure, diarrhoea and kidney pains, to name but a few. *Ayurveda* is an alternative medical system that has been practiced for more than 2,000 years primarily on the Indian subcontinent where it is

used by 80 per cent of the population. It is one of the world's oldest medical systems. It originated in India and has evolved there over thousands of years (<http://www.miracletrees.org>). *Ayurveda* includes diet and herbal remedies and emphasizes the use of body, mind, and spirit in disease prevention and treatment. The word *Ayurveda* is derived from two Sankrit words “*ayus*” and “*veda*” meaning life and knowledge or science, respectively; so *Ayurveda* literally means the science of life. *Ayurveda* is based on ideas from Hinduism, one of the world's oldest and largest religions. Many *Ayurvedic* practices were handed down by word of mouth just like African traditional medicines and were used before there were written records. In India, tradition maintains that the *Moringa* tree can prevent and cure 300 diseases.

Fuglie (1999, 2000), reveals that conventional medical doctors use *Moringa* to treat diabetes in West Africa and high blood pressure in India, besides malnutrition. Fuglie (1999), then director for Church World Service (CWS), West Africa, found that powdered *Moringa* leaves were more readily embraced by rural villagers than other dietary aids and decided to put it to the test. After a two year pilot project in the southwest villages of Senegal, the organization recently convinced the Senegalese government to promote *Moringa* as part of the national diet. In a 65 page book on the project, Fuglie (2000) described the willingness of a hospital administrator to substitute *Moringa* for the classical and costly methods of using whole milk powder, vegetable oil and sugar to treat malnutrition. The World Health Organization (WHO) estimates that nearly 80 per cent of the world's population relies on traditional medicine (the use of plants) for their primary healthcare (Kurian, 2007; Adams, 2003). With *Moringa* being promoted in many of the Third World, the tree crop can meet the needs of local populations in terms of availability, accessibility, and utilization. Available, in that it is already growing in areas of need, with spontaneous growth in many regions, and is a hearty and drought tolerant plant. Accessible, in that unlike imported medicine, foods, or other supplements, the cost per quantity of locally grown *Moringa* is very cheap making *Moringa* affordable to poor populations both in rural and urban areas. Its potential as a cheap local supplement in the fight against malnutrition is promising. It is so promising that dozens of humanitarian organizations and non-governmental organizations including the Church World Service (CWS), the Educational Concerns for Hunger Organizations

(ECHO), Trees for Life (TL), Miracle Tress (MT), Trees for Africa (TA), Petauke Community Forests (PCF) and the National Science Foundation (NSF) now promote the use of *Moringa oleifera* in poverty-stricken areas to combat malnutrition (www.miracletrees.org/moringatree.html).

Natural water treatment using *Moringa* seeds

Crushed *Moringa* seeds (powder) clarify and purify river water to suit domestic use and lower the bacterial concentration in the water making it clean and safe for drinking for some Petauke households. Many use 15 seeds to treat 20 litres of water. Duke (1982), also reports that seed kernels of the *Moringa* tree possess natural flocculents and are used by people in Sudan to purify the turbid waters of the Nile. *Moringa* seed powder can be used as a quick and simple method for cleaning dirty river water. Studies have shown that this simple method of filtering diminishes water pollution. The powder joins with the solids in the water and sinks to the bottom. This treatment also removes 90-99 per cent of bacteria contained in water (<http://www.miracletrees.org>). In general, one seed kernel will treat one litre of water (Fuglie, 1999; 2000). See Plate 14 as an illustration of what dirty water would look like after being treated with *Moringa* seed powder.



Plate 14: Illustration of dirty water treated with *Moringa* seed powder (Source: www.miracletrees.org)

Chipofya *et. al.*, (1996), reported that the Department of Engineering at Leicester University has extensively studied *Moringa*'s flocculent properties and once implemented a pilot project in Malawi which used *Moringa* seed kernels to purify water in a community water-treatment plant. This is an approach which supports indigenous knowledge with Western laboratory research.

By using crushed *Moringa* seeds people in Petauke communities will no longer be depending on expensive means originating from the Western countries. Using *Moringa* to purify water replaces chemicals such as aluminium sulphate, which are dangerous to people and the environment, and are expensive. Church World Service (CWS) initiated a programme in Senegal which has demonstrated that the highly nutritious leaves of the plant are very effective at helping prevent malnutrition and the crushed seeds purify water obtained from rivers, streams and shallow wells (Fuglie, 1999). The pilot phase began in June, 1997. Agir Autrement pour le Developement en Afrique, or Alternative Action for African Development (AGADA) is the local partner. The organization has promoted similar projects in Burkina Faso, Gambia, Guinea Bissau, Mali and Niger, where mothers, children, and other members of various communities are benefiting from eating the leaves, seeds and pods of the *Moringa* tree.

Moringa oleifera can be highly recommended for domestic water purification in Third World countries, where people often drink contaminated turbid water. In addition to food, shelter and clothing, water is one of our basic human needs and lack of potable water is a major cause of death and disease in our world. Using natural materials to clarify water is a technique that has been practiced for centuries and of all the materials that have been used, seeds of the *Moringa* have been found to be one of the most effective. Studies have been conducted since the early 1970s to test the effectiveness of *Moringa* seeds for treating water (Fuglie, 1999; Chipofya *et. al.*, 1996). These studies have confirmed that the seeds are highly effective in removing suspended particles from water with medium to high levels of turbidity (*Moringa* seeds are less effective at treating water with low levels of turbidity).

Moringa oleifera seeds treat water on two levels, acting both as a coagulant and an antimicrobial agent. It is generally accepted that *Moringa* works as a coagulant due to positively charged, water-soluble proteins, which bind with negatively charged particles (silt, clay, bacteria, toxins, etc) allowing the resulting “flocs” to settle to the bottom or be removed by filtration. The antimicrobial aspects of *Moringa* continue to be researched. Findings support recombinant proteins both removing microorganisms by coagulation as well as acting directly as growth inhibitors of the microorganisms. While there is research being conducted on the nature and characteristics of these components, it is generally accepted that treatments with *Moringa* solutions will remove 90-99 per cent of the impurities in water. Solutions of *Moringa* seeds for water treatment may be prepared from seed kernels or from the solid residue left over after oil extraction (press-cake). *Moringa* seeds, seed kernels or dried press-cake can be stored for long periods but *Moringa* solutions for treating water should be prepared fresh each time. Pressed *Moringa* seeds can turn a tumbler of bacteria-laced river muck into clean water more economically than imported chemicals (Chipofya *et. al.*, 1996). The seed powder can be used as a quick and simple method for cleaning dirty river water. The powder joins with the solids in the water and sinks to the bottom.

Making Moringa seed powder to purify water at household level

Twenty litres of water can be treated in the following way:

1. Remove the wings and brown seed coat and discard any seed kernels that have dark spots or any other signs of damage.
2. Pound the kernels to a fine powder.
3. Add two grams (2 small spoons) of powder to one cup of clean water; pour the solution into a bottle and shake for five minutes.
4. Filter the solution through a clean cloth into the bucket of dirty water that is to be treated.
5. Stir the water quickly for two minutes and slowly for 10 to 15 minutes (do not use metal implements).
6. Leave the bucket undisturbed for one hour or until the water becomes clear and the impurities have sunk to the bottom.
7. Filter the water through a clean cloth

8. Boil and let the water to cool while covered before drinking. When there is lack of energy or time for one to boil the water, the filtered water at stage seven above can still be safe to drink as it is about 90 per cent purified. When you can't boil dirty, polluted water, use *Moringa* seeds. Using *Moringa* seeds is a good and inexpensive way to clean your water and help prevent sickness in your family.

Water from varying sources will need different amounts of powder because the amount of impurities present will not be the same. Experiments with a jar will help in working out the correct amount needed. It should be noted that both the seeds and the seed powder can be stored but the solution made in stage three above should not be stored. It should be freshly made every time water is to be purified. Honey and sugarcane juice can also be cleared of impurities using the powder. This TEK can be effectively shared using dialogue education in not only rural communities but even in peri-urban areas of our cities where safe drinking water is often scarce. The present study found that a number of respondents interviewed mentioned lack of clean and safe drinking water as one of the major problems the population face in Petauke district. It can safely be suggested then that if the entire community was to adopt the use of *Moringa* seed powder to treat water, more people could have access to clean and safe drinking water than was the case during the research. *Moringa* seed powder can be used as a locally-produced substitute for imported flocculent, thus reducing expenditure of foreign currency reserves by Third World countries like Zambia.

Moringa seeds can also produce multi-purpose-oil that can be used by industries for products like cooking oil, bathing soap, shampoo, body lotion and other personal health care products (Fahey, 2005). *Moringa oleifera* holds promise as a sustainable crop which can benefit humans and animals nutritionally, economically and as an energy source. The future looks very promising for *Moringa* especially in the formulation of medicine and in the manufacture of perfumes and cosmetics. With adequate research, *Moringa* oil can also be an alternative source of biofuel in Zambia besides *Jatropha*. As feed, the leaf and cake of the *Moringa* seeds can also be used as animal feed for goat, pig, cattle, chicken and ducks. Indeed, a traditional food plant in Africa, this little-known vegetable tree has

potential to improve nutrition, boost food security, foster rural development and support sustainable landcare in the tropics and sub-tropical lands in Third World countries.

5.3.4 *Jatropha* tree planting in Petauke

The study found that another interesting wonder tree being promoted in Petauke by the Petauke Forests Community NGO is *Jatropha*. *Jatropha curcas* is a wild plant that has been growing in the tropics for centuries and used as a remedy for constipation, malaria and high fever. It was introduced into Zambia around 1850. It is thought to have originated in Central America and Mexico, where it occurs naturally in coastal regions. (<http://www.bbc.co.uk/radio4/science/pip/ogsgf/>). But as oil prices rise and the impact of global warming becomes clearer, *Jatropha* is being cultivated and planted on a massive scale for use as a biofuel in many countries such as India. *Jatropha* oil is a strongest substitute for diesel. Apart from this it is used for producing medicated soap, wonderful candles, and skincare and cosmetics. The seed oil can be applied to treat eczema and skin diseases and to soothe rheumatic pain (Duke, 1983; Heller, 1996). The 36 per cent linoleic acid content in *Jatropha* kernel oil is of possible interest for skincare (Heller, 1996). The oil and aqueous extract from oil has potential as an insecticide. For instance, it has been used in the control of insect pests of cotton including cotton bollworm, and on pests of pulses, potato and maize. Methanol extracts of *Jatropha* seed (which contains biodegradable toxins) are being tested in Germany for control of bilharzia-carrying water snails. And the pesticidal action of the seed oil is also the subject of research of International Crops Research Institute for the Semi-Arid Tropics, (ICRISAT) in India (Henning, 1996). *Jatropha* oil is also used to soften leather and lubricate machinery (e.g. chain saws). Seed-cake or press-cake is a by-product of oil extraction. *Jatropha* seed-cake contains curcin, a highly toxic protein similar to ricin in Castor, making it unsuitable for animal feed. However, it does have potential as an organic fertilizer.

Henning (1996), reports that while burning, *Jatropha* oil does not emit fumes - hence in rural areas of Mali it is used for lighting and cooking purposes. In China, *Jatropha* oil is also used for making varnish. The skin and raw leaves of *Jatropha* are used in making dyes in Jamaica and other countries. *Jatropha curcas* or physic nut, is a bush or small tree (which grows up to five metres in height) and belongs to the euphorbia family. It can live

up to between 30 and 50 years still producing seeds. The genus *Jatropha* contains approximately 170 known species. The genus name *Jatropha* derives from the Greek *jatrós* (doctor), *trophé* (food), which implies medicinal uses. *Curcas* is the common name for physic nut in Malabar, India. *Jatropha curcas* is said to originate from Mexico and Central America. From the Caribbean, *Jatropha curcas* was probably distributed by Portuguese seafarers via the Cape Verde Islands and former Portuguese Guinea (now Guinea Bissau) to other countries in Africa such as one of Zambia's neighbour, Mozambique and Asia. Today it is cultivated in almost all tropical and subtropical countries as protection hedges around gardens and fields, since it is not browsed by cattle, goats or other livestock. The plant is planted as a hedge (living fence) by farmers around their farms, gardens and homesteads all over the world. *Jatropha* farming has been shown to have some additional benefits besides reforestation. The primary conservation benefits to be derived from production of *Jatropha* relate to improved soil management. *Jatropha* leaves that shade in dry season increase organic matter and life to soil. *Jatropha* seed shells and press-cakes obtained after oil extraction can also be useful organic matter to enrich the soil. The enriched soil becomes more productive for any crops including tree crops in Petauke. This would improve food security, increase income (part of which could be used for education of children), reduce poverty as well as contribute to improved environmental sustainability among rural community members.

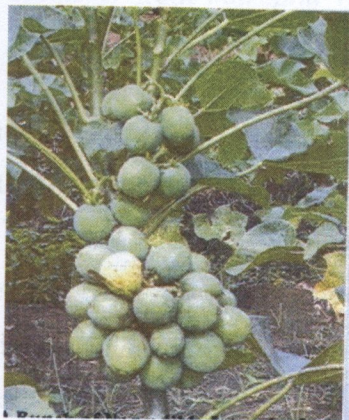


Plate 15: *Jatropha* plant with fruits in "Kakweŵa-Lusowe watershed" community. (photo by the researcher)

In Petauke, *Jatropha* is known as *Mono ukunda* in *Chinsenga* – mostly because it was introduced to the area from the Chikunda people in the neighbouring Mozambique. The

plant can easily be grown alongside other crops like potatoes or maize, on the boundaries between fields. At an average height of 2.5 to three metres, the hedges serve as 'living fences,' controlling unwanted animal access to cultivated fields, and significantly reducing the erosion of fertile soils by both wind and water. Interestingly, the *Jatropha* hedge's flowers have been discovered to strongly attract honeybees, creating the potential for the emergence of local beekeeping and honey export businesses as well. It has been reported by *Jatropha*-world that *Jatropha* produces seeds with an oil content of 30 to 37 per cent. The oil can be combusted as fuel without being refined. It burns with clear smoke-free flame, tested successfully as fuel for simple diesel engine. The by-products are press cake, a good organic fertilizer - phosphates and potash - eliminating the need to import expensive, oil-based synthetic fertilizers which are harmful to the soils. Oil also contains insecticide (www.jatrophaworld.org). Moreover, the process of converting *Jatropha* oil into biodiesel generates seven per cent glycerin as a byproduct. Glycerin is a versatile chemical used in the manufacture of cosmetics and pharmaceuticals, and it has been reported to sell for approximately \$1.50 per kilogram (\$1,500 per tonne) elsewhere (www.jatrophaworld.org). The glycerin byproduct can be supplied to local and international manufacturers of soaps, medicines or cosmetics, or sold in the open market to compete with glycerin produced from hydrocarbon fuel. It should be mentioned, however that *Jatropha* plants require up to five years to reach full production of seeds, and creation of marketable biodiesel from *Jatropha* requires the use of 25 per cent ethanol in its production.

Ethanol from sugarcane is an excellent stand-alone fuel, as well, and has applications ranging from small generators, to motor transport fuel, to cook-stoves. Sugarcane cultivation programmes can be pursued in many regions of Africa and Latin America which might not seem immediately suitable for cane crops, but which have subsurface aquifers or nearby rivers which can be utilized for irrigation. In other cases, sweet sorghum can be planted instead of or in addition to sugar cane. Intensive cultivation of both *Moringa* and *Jatropha* trees in Petauke will not only help with reforestation but will also greatly increase income, tourism and health of communities. It is important to mention, however, that the growing and management of *Jatropha*, either on private public or community lands is poorly documented and there is little field experience that is

being shared, especially in southern Africa. Currently, growers are unable to achieve the optimum economic benefits from the plant, especially for all its various uses. The markets for the different products have not been properly explored or quantified, nor have the costs or returns (both tangible and intangible) to supply raw materials or products to these markets. Consequently, the actual or potential growers including those in the subsistence sector do not have an adequate information base about the potential and economics of this plant to make decisions relating to their livelihood, not to mention its commercial exploitation.

It is, therefore, timely to examine the potential role that *Jatropha* can play in meeting some of the needs for energy services for rural communities and also creating avenues for greater employment. It is important that the dialogue on the exploration of potential of *Jatropha* should include the multiple stakeholders involved in research, utilization and exploration of this oil plant including government officials, NGOs, private sector, etc.

5.3.5 *Luceana* tree planting in Petauke

Another interesting tree being promoted in Petauke community by PFC is *Luceana*. *Luceana* is reported in Conservation Farming Unit (1997) to be leguminous and has multiple uses. It is suitable for particle board, roofing felt, hardboard, textiles, nonwoven fibres, paper making, rope making, building materials, oil absorbent, soil erosion control, fuel briquettes and rich organic fertilizer. Its diverse uses in the tropics include use in general agro-forestry, reforestation of eroded hill slopes, windbreaks, shade and nurse plants for tropical crops, and as an ornamental. *Luceana* leaves are an excellent livestock feed, especially for goats and dairy cattle to increase milk production. Below is a photograph showing a plant of *Luceana* being promoted in Petauke district to help with reforestation. Although dialogue education cannot solve all problems in the study area, if effectively utilized it can enable community members actively participate through critical thinking in identifying major problems like environmental degradation and come up with possible sustainable solutions within the communities.



Plate 16: Luceana tree growing as a windbreaker at Forestry offices in Petauke. (Photo by the researcher)

The reader may be reminded that in modern society knowledge evolves constantly; and the knowledge and skills needed for a whole life cannot be learned just once and relied on forever. New knowledge and new skills will have to be acquired at all times. Knowledge is not restricted to specific disciplines, but includes know-how, life skills, competencies, attitudes, aptitudes, values, etc. Knowledge is information which has been reconstructed by the individual in the light of context or personal experience, and is organized into a structured whole. It can be safe, therefore, to argue that we must be concerned with the use rather than the storage of knowledge. Dialogue education can be utilized as the best tool to achieve this participatory education. This is what adult educators and other community development agents should practice with adult learners using dialogue education to achieve sustainable development. In environmental adult education we generally follow the widely understood definition of sustainable development as a development that meets the needs of the present generation without compromising the ability and opportunities of future generations to meet their own needs (UN, 2006).

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents a summary of, and conclusion to, the findings of the study on the role of dialogue education in ensuring environmental sustainability in Petauke district, Zambia. The chapter tries to answer the research questions in relation to the outcome of research analysis. The practical implications of the study are also discussed in this chapter. The chapter further gives recommendations which could act as a guide to future implementations of environmental adult education programmes to improve environmental sustainability in Petauke district. This may contribute to ensuring that environmental education process becomes more participatory and effective in the study area, using dialogue education, than it was at the time of the research. In conclusion, the chapter gives suggestions and implications for future research.

The overall objective of the study was to investigate the role of dialogue education in ensuring environmental sustainability among illiterates and semi-literates in Petauke district. This was to be achieved by answering the research questions which centred around finding out how illiterates and semi-literates learn about environmental sustainability; the levels of awareness among illiterates and semi-literates on environmental sustainability; as well as ascertaining whether or not there was room for additional approaches to curb environmental degradation in Petauke district.

6.1 Summary of Findings

Using the triangulation approach, the study proved beyond reasonable doubt that illiterate and semi-literate adults in Petauke learnt about environmental sustainability mostly through informal and non-formal education. It was found that many adults learnt through their close interactions and dialoguing with family members, friends, colleagues and associates. Traditional environmental knowledge was found to play a critical role in this regard. Local knowledge systems in the district have evolved from ongoing experimentation to resolve agricultural, environmental, health, and other social problems

in a particular agro-ecological and socio-cultural context. Traditional environmental knowledge can greatly be enhanced through dialogue education. This would improve environmental sustainability whose emphasis is on the proper use of natural resources and regeneration of the ecosystem so that future generations have the same opportunities as the present ones.

The study also revealed that few respondents indicated that illiterates and semi-literates learnt through the informal education using mass media, drama, song and dance as well as non-formal field demonstrations facilitated by forestry, agricultural and wildlife extension workers.

The general picture from this study, however, was that the levels of awareness on environmental sustainability among the illiterates and semi-literates in Petauke were low. The findings were presented in Chapter Four and discussed and analyzed in Chapter Five of this dissertation. The study further revealed that while the illiterates learnt about environmental sustainability, their participation and levels of awareness for environmental sustainability activities were low.

On the other hand, the study revealed that most respondents indicated that there was room for additional approaches to be introduced to curb environmental degradation in the study area of Petauke district. Among the other approaches revealed in the study were the introduction of environmental clubs in villages and townships to provide non-formal education on environmental sustainability; establishment of more community-based natural resource management projects in the district; more inclusive education on conservation and organic farming systems; use of community radios to broadcast interactive educative family programmes on environmental sustainability with some listening groups in various communities such as village development committees; and adult literacy educators could, in collaboration with other stakeholders, facilitate programmes to foster dialogue education targeting household levels as traditional *nsaka* no longer existed after the coming of the capitalist liberalization in the study area.

6.2 Conclusion

The conclusion is closely tied to the purpose of the study, which sought to find out the role of dialogue education in ensuring environmental sustainability among illiterates and semi-literates in Petauke, Zambia. Environmental adult education is a very necessary and significant process in any community. Environmental adult education as a process is normally supposed to be participatory in nature and should include the input of everyone in a community: literate, illiterate - men, women, youths as well as the elderly. To be effective, environmental adult education should, among others, use dialogue education to incorporate both indigenous knowledge and modern scientific knowledge. The saying that “we are all learners and educators” as in Lindeman (1956), Freire (1972) and International Labour Organization (ILO) (1993) is very true when it comes to environmental adult education. We all have to be active participants through dialogue education.

Throughout the study, respondents cited that illiterate and semi-literate adults learnt through interactive communication of informal and non-formal education. This existing interactive communication can be enhanced and incorporated into participatory dialogue education, a critical component in environmental adult education and sustainable management of the environment. Participatory methods allow learners to make connections between social issues and environmental problems. This connection allows adult learners to understand the core causes of major environmental issues and the resulting social inequalities. In line with critical theory and transformational learning theory, participatory dialogue education enables learners to become critical thinkers and improve their analytical skills. This method also allows educators to stress the importance of instilling environmental awareness so that learners do not forget their critical relationship with the natural world at all times in line with the saying: “Think globally, act locally” (Walter, 2004). Participatory dialogue education will – among other achievements – enhance committed leadership in communities, strengthen partnerships, and deepen participation by the disadvantaged rural poor. This will help the world, mostly occupied by the poor, back on track towards achieving most MDGs. This study supplies the educator with ideas and attitudes that one educates with, not to learners,

using dialogue education. To sum this study, dialogue education will add value to the process of education for all.

6.3 Recommendations

- 6.3.1** (a) The findings of the study call for concern of all educationists in general and the environmental adult educator in particular who potentially can intervene to prevent and mitigate the root causes of environmental degradation in our society to achieve environmental sustainability. In line with the findings that illiterate and semi-literate adults in Petauke learnt mostly through informal and non-formal education about environmental sustainability, it is recommended that adult educationists adopt dialogue education in their literacy programmes to promote a critical thinking society that will learn to utilize and respect natural environment for their benefits as well as for future generations, not exploitation and destruction of natural resources. It is further recommended that adult educators enormously make use of existing local TEK in collaboration with modern environmental sustainability knowledge when facilitating environmental adult education activities among illiterates in rural communities. This will enhance the awareness levels on environmental sustainability among the citizenry.
- (b) It is recommended that interactive dialogue education be utilized as a technique to increase critical awareness of environmental sustainability and further contribute to facilitating education for all that will help Zambia achieve her Vision 2030 with an educated human resource.
- (c) The mass media such as the community radios should be effectively utilized to provide education on environmental sustainability in local languages in communities with high illiteracy such as many rural areas. Listening groups could be formed in communities among members of community environmental clubs, village development committees, ward development committees and district development committees. These listening groups could reflect on environmental-related themes and share with other members of community including family members. This arrangement can supplement face-to-face dialogue education.

(d) Adult educators should take a deliberate policy to incorporate environmental education in their programmes with clients. To summarize the methods of environmental adult education programmes, environmental adult educators should strive to instill learners with:

- a knowledge of environmental problems and their causes;
- the skills to engage in social activism to combat those problems;
- the attitude of respect and connection to the natural world; and
- a desire to change current practices to protect the planet Earth.

Our challenges as environmental adult educators are to acknowledge, respect and tap into existing ecological knowledge while at the same time challenging assumptions, providing opportunity for critical reflection, and dealing with feelings of fear, confusion, and powerlessness. We also need to work within a framework that is not based solely on science, but rather identifies the ways in which environmental problems result not just from individual inadequacy but are rather a necessary byproduct of capitalism. Capitalism encourages aggressiveness and destruction that leads to environmental degradation while striving to maximize profits for a few without much consideration for the future of nature and humanity. As mentioned in chapter two of this study, environmental degradation is a result of the human exploitation of the earth's natural resources initially introduced in third world countries by the Westerners. As African and Third World adult educators we need to help people to imagine and develop alternatives through praxis and conscientization, not simply awareness-raising, through collective political work, not simply behaviour change. We need to use the rest of nature as teacher and site of learning, not just as a place of "facts" and "names." Learning is situational and contextual, and there is a wealth of knowledge and experience out there, if we choose to use it to learn and develop using dialogue education.

(e) Sensitization of the population in environmental conservation and the need for sustainable development is the only option if the effects of climate change are

to be reversed in Zambia and the world at large. Dialogue education can effectively do this task.

6.3.2 Future research

In line with the findings of this study, the following areas of future research are suggested:

- (a) A study on a similar topic could take a comparative approach. Comparisons could be made on how illiterate adults learn about environmental sustainability in other parts of Zambia. It would further be interesting to compare and contrast how illiterates and literate adults learn about environmental sustainability in Zambia. A comparative study based on gender could also be undertaken.
- (b) Future research could also endeavour to document traditional environmental knowledge available in our Zambian communities, especially rural areas, when we still have elderly people rich with the information so that future generations could benefit.

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APPENDICES

APPENDIX A

A Letter of Introduction



UNIVERSITY OF ZAMBIA SCHOOL OF EDUCATION

Telephone: 291381
Fax: +260-1-292702

P O Box 32379
Lusaka, Zambia

30th January, 2008

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: FIELD WORK FOR M.ED STUDENTS

The bearer of this letter Mr./Ms. STEPHEN BANDA computer number 526004135 is a duly registered student at the University of Zambia, School of Education.

The student is taking a Masters Programme in Education. The Programme has a fieldwork component which he/she has to complete.

We shall greatly appreciate if the necessary assistance is rendered to him/her.

Yours Faithfully


P. C. Manchishi (Dr.)

ASSISTANT DEAN (PG), SCHOOL OF EDUCATION

cc. Dean, Education
Director, DRGS

APPENDIX B

Focus Group Discussions (FGDs) guide for Petauke community residents' development committees on environmental sustainability

At the beginning of the meeting, I will introduce myself as facilitator and introduce the recorder. I will let participants introduce themselves with whatever names they wish to use. Put the participants at ease and explain the purpose of the FGDs, the kind of information needed, and how the information will be used (for academic purpose only). I will also ask permission to use a tape-recorder, and let people hear their own voices before the session starts.

Date:

Time:

Place:

Guiding questions:

1. What do you understand by 'Make Zambia clean and healthy' campaign?
2. Who is supposed to take part in the campaign?
3. How do you contribute to the campaign?
4. What benefits do you get from the natural environment around your community?
5. In your view, what would it be like if all trees in this community were cut down?
6. In your view, how do adult people that cannot read or write learn about taking care of their natural environment?
7. What can be done to improve our care for the natural environment in the community?
8. In your view how can those who cannot read or write contribute to protecting, preserving and improve the natural environment?
9. What would you suggest be done to reduce environmental degradation in the community?

At the end of the meeting, I will take time to summarize, check for agreements as well as disagreements and thank the participants for their time and cooperation.

APPENDIX C

Questionnaire for Government officials, managers and other local leaders

Dear Respondent,

I am a postgraduate student at the University of Zambia pursuing a Master of Education programme in Adult Education. I am carrying out research on how adult people who cannot read and write in Petauke district learn about how to take care of their natural environment in line with 'Make Zambia Clean and Healthy' campaign and Millenium Development Goal (MDGs) number seven on ensuring environmental sustainability. The research is in partial fulfillment of my studies. In this regard, you have been selected to participate as a respondent. I would be grateful if you accept to be one of the respondents. The results of this research will be used for the improvement of adult education.

Please write down your answer/s in the space provided in the following questionnaire as carefully and as honestly as possible. Tick in the appropriate box for your response to the questions or statements with boxes in the questionnaire. The information written on this questionnaire will be treated with the highest confidentiality and it will be used for academic purposes only. Please **do not write your names on the questionnaire**.

I thank you most sincerely in advance,

Stephen Banda (student)

Date:

Sex:

A. Respondent's Identification

1. Which organization do you work for?

2. How long have you been working in Petauke district?

B. Questions related to how adults learn about environmental sustainability

3. What do you understand by the term environmental sustainability programmes?

4. What environmental sustainability programmes are you aware of in Petauke community that involve adult people that cannot read or write?

5. What kind of environmental sustainability programmes in line with 'Make Zambia Clean and Healthy' campaign are you and your organization involved in?

6. In which way(s) are the people who cannot read and write involved in programmes concerning taking care of the natural environment in Petauke?

7. Do you agree that adults who cannot read and write in this district do learn about how to protect, conserve and improve their natural environment?

Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []

8. Do you agree that adults who cannot read or write do not take part in activities that promote environmental sustainability in Petauke district?

Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []

9. Do you agree that adults who cannot read or write are aware of need for environmental sustainability in their community?

Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []

10. In your opinion, is there room for additional environmental sustainability approaches to be introduced to curb environmental degradation in Petauke?

Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []

11. What, in your view, can be done to increase the participation of the adults who cannot read or write in the environmental sustainability programmes?

12. In your opinion, how do the adults who cannot read or write in this community learn about environmental sustainability?

Through dialogue with others [] Through the mass media []

Through drama, song and dance [] Through field demonstrations []

13. In your view, in which other ways can adults who cannot read or write learn about how to take care of their natural environment?

14. In what ways are the people who cannot read or write involved in programmes of environmental sustainability in Petauke community?

15. In your own opinion what are the advantages of involving illiterate adults in environmental sustainability programmes in the community?

16. What main difficulties do you face in trying to educate the residents on issues to do with the environment?

17. In your opinion, what can be done to stop environmental degradation in Petauke community?

Thank you for responding to the questionnaire.

APPENDIX D

Semi-structured Interview Guide for residents of Showground compound and Kakweŵa-Lusowe watershed communities

Dear Respondent,

My name is Stephen Banda. I am a postgraduate student pursuing a Master of Education programme in adult education at the University of Zambia, Lusaka. I am carrying out research in the area of how adult people in Petauke district learn about how to take care of their natural environment. The research is part of my studies. I would be grateful if you allow to be interviewed.

Note: The information that will be discussed, collected and recorded will be used for academic purposes only and confidentiality on the part of the respondent shall be upheld. The respondent may withdraw from the interview at any stage.

Date: _____

Sex of respondent: Male [] Female []

A. Respondent's Identification

5. Where do you live?

6. When were you born?

1900-1920 [] 1921-1940 [] 1941-1960 [] 1961-1980 [] 1981-2000 []

7. How long have you been living in Petauke district?

B. Questions related to how adults learn about environmental sustainability

8. What do you do to sustain your livelihood and your family?

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ALL No.

9. What major problems do you face to sustain your livelihood?

6. What would you suggest to be done to solve the problems?

7. Are you aware of the 'Make Zambia Clean and Healthy' campaign?
Yes [☐] No [☐]
8. In which ways do you and your family contribute to 'Make Zambia clean and healthy'?

9. What environmental sustainability programmes are you aware of in your community that involve adult people that cannot read or write?

10. In what ways do you contribute to protect, preserve and improve the natural resources in your community?

11. In which way(s) are the people who cannot read and write involved in programmes concerning taking care of the natural environment in your community?

12. Do you agree that adults who cannot read or write do not take part in activities that promote environmental sustainability in Petauke district?
Strongly agree [☐] Agree [☐] Undecided [☐] Do not agree [☐] Strongly do not agree [☐]

13. Do you agree that adults who cannot read and write in this district do learn about how to protect, conserve and improve their natural environment?
Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []
14. In which ways do people who cannot read or write learn about how to protect, preserve and improve the natural environment?
Sharing traditional environmental knowledge [] Mass media []
Drama, dance and song [] Field demonstrations by extension workers []
15. In your view, in which other ways can adults who cannot read or write learn about how to take care of their natural environment?

16. Do you agree that adults who cannot read or write are aware of need for environmental sustainability in their community?
Strongly agree [] Agree [] Undecided [] Do not agree [] Strongly do not agree []
17. What major difficulties do you face on issues to do with the natural environment in your community today?

18. In your opinion, what can be done to curb environmental degradation in your community?

19. What in your view can be done to increase the participation of the adults who cannot read or write in the environmental sustainability programmes?

20. In what ways are the people who cannot read or write involved in programmes of environmental sustainability in Petauke community?

21. In your own opinion what are the advantages of involving illiterate adults in environmental sustainability programmes in the community?

22. In your opinion, do you think there is room to introduce additional approaches to curb environmental degradation in Petauke community? Yes [☐] No [☐]

23. In your opinion, what can be done to stop environmental degradation in Petauke community?

We have come to the end of our interviews.

Thank you for your time and cooperation.