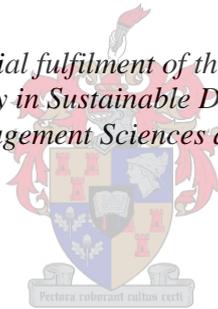


The integration of school garden activities, the classroom and the feeding scheme: A case study of two primary schools in Tigray, North Ethiopia

by
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*Thesis presented in partial fulfilment of the requirements for the degree
of Master of Philosophy in Sustainable Development in the Faculty of
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Cr tln2014

Declaration

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Abstract

In an increasingly complex world where food security remains a challenge in many areas and especially Africa; it is essential to educate children about food – from production to consumption; and to ensure they eat enough as this is a crucial factor for concentration and learning abilities. How can we teach children about food in a sustainable way?

This study focuses on schools in Tigray, Northern Ethiopia, which have a school feeding programme, school garden and nutrition curriculum. The question studied is: To what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

The methodology chosen is a case study and the empirical data was collected through interviews, surveys and observations. Principals of 14 schools were interviewed about the school gardens, curricula and school gardens. Two schools were then selected for a further in-depth research.

The school gardens, mostly initiated by the staff, serve the purpose of creating income for the school and teaching students the skills of gardening. The curriculum is standard for Tigray and focuses on different food types and creating a balanced diet. The school food in most schools is provided by the World Food Programme (WFP), but some exceptions exist.

This research shows that integration between the three objectives will be beneficial. Obstacles include getting the staff ‘on board’ as a priority and controlling the unification of the three, for example schools feel that they have less ownership over the feeding scheme because it is organised by an external NGO.

This study suggests stakeholders view school gardens, nutrition education and school feeding schemes under one umbrella for the ultimate benefit of creating a sustainable model to teach about food. The case study provides an insight to the specific challenges in Tigray, Ethiopia but important conclusions can also be generalised.

Opsomming

In 'n toenemend komplekse wêreld waar voedsel sekuriteit in baie gebiede, veral in Afrika 'n uitdaging bly, is dit baie belangrik om kinders oor voedsel op te voed - vanaf produksie tot by die verbruik daarvan, en ook om seker te maak dat hulle genoeg eet, wat baie belangrik is vir konsentrasie en die vermoë om te leer. Hoe kan ons kinders op 'n volhoubare manier leer oor voeding?

Hierdie studie fokus op twee skole in Tigray, in Ethiopië wat skoolvoedingskemas, skooltuine en voedingkurrikula het. Die vraag wat gevra is, is: Tot watter mate integreer hierdie twee skole in Tigray die voedingskemas, die skooltuine en die voedingkurrikula?

Die gekose metodologie is 'n gevallestudie. Empiriese data is ook deur middel van onderhoude, oorsigte en observasies versamel. Onderhoude oor skooltuine, voedingskemas en die kurrikula is gevoer met die skoolhoofde van 14 skole. Twee skole is toe gekies vir in-diepte navorsing.

Die skooltuine bring geld in vir die skool en word ook gebruik om vir die leerling tuinmaakvaardighede aan te leer. Die kurrikulum is standaard vir die hele Tigray en word deur die Wêreld Voedsel Program verskaf. Daar is egter 'n paar uitsonderings. In hierdie navorsing is daar bewys dat die integrasie van die skooltuin, die voedingskema en die kurrikula, goeie gevolge kan hê. Dit is egter belangrik dat die skool personeel moet saamwerk en dat die vereniging van die drie beheer moet word. Skole voel bv. Tans dat hulle nie eienaarskap oor die voedingskema het nie, want dit word deur eksterne NROs beheer.

Hierdie navorser stel voor dat die skooltuine, skoolvoedingskema en die voedingkurrikulum onder een sambreel beskou moet word met die doel om 'n volhoubare model vir die onderrig van voeding te skep. Die gevallestudie verskaf insig in die spesifieke uitdagings in Tigray, Ethiopië, maar belangrike slotsomme kan ook veralgemeen word.

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List of Acronyms and Abbreviations

CHILD-schools	Children in Local Development Schools
CSB	Corn Soya Blend flower
DESD	United Nations Decade of Education for Sustainable Development
ESD	Education for Sustainable development
FAO	Food and Agriculture Organisation
FFE	Food For Education
FSiAbd	Food Security and Integrated Agricultural Business Development
GBL	Garden Based Learning
GER	Gross Enrolment Ratio
HGSF	Home-Grown School Feeding programme
HIV	Human Immunodeficiency Virus
ISD	Institute for Sustainable Development
NET	Net Enrolment Ratio
NGO	Non-Governmental Organisation
PSNP	Productive Safety Net Programme
RQ	Research Question
SIP	Sweet Potato Project
STVC	Selam Technical and Vocational Center in Ethiopia
TD	Trans disciplinary Approach
THR	Take Home Rations
UNCHR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	World Food Programme

Key Phrases

Berberere	Specific type of paprika powder - much used in the Ethiopian kitchen.
Ethiopian time	6 o'clock in the morning is 00.00 o'clock in Ethiopian time, so a time difference of six hours with Universal Time.
Ethiopian year	The Ethiopian calendar is seven years behind on the international calendar. Internationally it is 2013 and 2005 in Ethiopia.
Fafa	Porridge made out of soya corn blend flour, oil, salt and water.
Injera	Big pancake made out of teff – staple food in Ethiopia.
Kebelle	Small village or neighbourhood.
Shiro	Sauce made out of lentils, oil and berbere.
Tabia	Group of Kebelle's which form a municipality.
Teff	Indigenous grain used to make injera.
Tibbs	Small pieces of roasted meat.
Woreda	Region within the state.

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Chapter 1 – Introduction

1.1 Introduction

The challenge of education is to equip the children of today for the uncertain future of tomorrow within a challenged world. The world faces a polycrisis; with challenges that are interconnected wicked problems (Swilling and Annecke, 2012). One of these crises is food: food security, healthy diets and food production. How might these factors be integrated in a sustainable way, and what is the role of education?

This Master of Philosophy (MPhil in Sustainable Development) thesis attempts to answer these questions through an exploration of the possibilities of integrating a sustainable nutrition curriculum with a sustainable feeding scheme. I will research to what extent the school garden, feeding scheme and nutrition curricula have been integrated or could be integrated in two schools in Tigray, Northern Ethiopia. These schools have gardens, a feeding scheme and nutrition curricula; and I aim to investigate to what extent these three have been integrated in order to teach children about the relations between these areas and to maximise the learning opportunities.

This chapter starts with background information and the rationale for the research. Thereafter the research objectives and primary question are described, followed by the value and relevance of the study. The introduction to the research design and methodology is next; followed by the research strategy and the ethical implications of the research. The chapter ends with an outline of the chapters of this thesis.

1.2 Background and Motivation

1.2.1 Background

The world is facing a food crisis and Africa in particular has severe challenges with food security (Bundy, Burbano, Grosh, Gelli, Jukes and Drake, 2009; FAO, 2012). The number of hungry people in the world remains unacceptably high with 870

million people chronically undernourished (FAO, WFP and IFAD, 2012). A rapid rise in food and fuel prices and rapid climate change show the vulnerability of the system supporting the growing population (Dahl, 2012).

It seems logical for children to learn more extensively about food. While feeding schemes will likely to be necessary initially in some areas, these could be combined with education about food so as not to fall into the trap of only being a short-term solution; education about food and feeding schemes need to be integrated and require a long term view (David, Kimiywe, Waudu and Orodho, 2008; FAO, 2010).

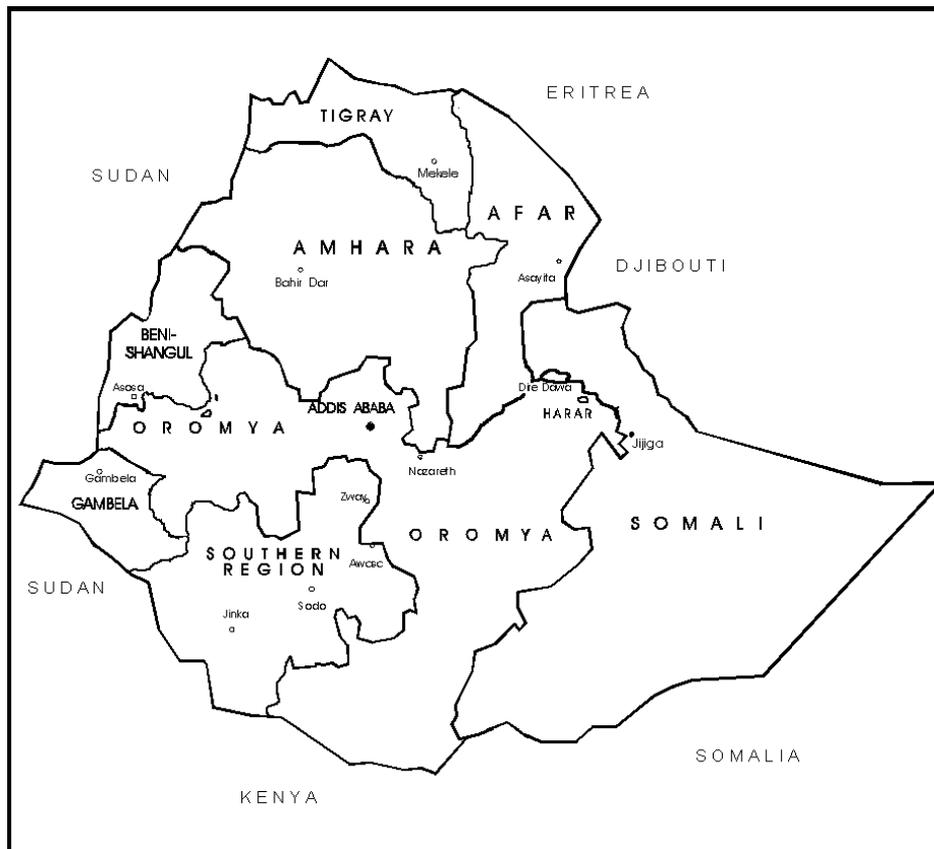
Tigray is the Northern state of Ethiopia; bordering with Eritrea in the North; Sudan in the west, Afar in the east and Amhara in the southwest (Edwards, Egziabher and Araya, 2010). The population of Tigray is 4.3 million people of which 58 per cent live in absolute poverty (earning less than a dollar a day); this is higher than the national average of 44.4 per cent (WFP-Ethiopia, 2009).

In total Ethiopia has a population of 86 million which is growing by 2.1 per cent per year (EFA GMR, 2012). Ethiopia's estimated economic growth over the last five years was around 10 per cent. Agriculture is the biggest sector; it accounts for 47 per cent of the GDP followed by the services sector (39 per cent) and the manufacturing sector (14 per cent) (WFP Ethiopia, 2009). For many years, Ethiopia has struggled with the challenge of achieving food security (WFP-Ethiopia, 2009; FAO, 2012). In the period from 1990 till 2012 the number of undernourished people is stable on 34 million people. Due to population growth this means that the percentage of undernourished people went down from 68 per cent till 40 per cent; although this is a strong decline the situation remains severe (FAO, WFP and IFAD, 2012). Agriculture is mainly rain-fed which makes it sensitive to climate changes (WFP-Ethiopia, 2009). Tigray in particular struggles with food security and malnutrition because of rapid population growth; recurrent cycle of drought; lack of diversification in economic activities and environmental degradation (Asayehegn, Yirga and Rajan, 2011; Van Der Veen and Tagel, 2011; FSiAbd report, 2012). Many children in Ethiopia are affected by health- and nutrition-related problems that constrain their ability to thrive and to benefit from education (Ministry of Education Ethiopia, 2012).

Food influences health, physical appearance, and the brain's ability to develop and has a significant impact on levels of learning concentration at school (Waley *et. al.*, 2003). Food is also a personal and cultural taste, but which food is available and how taste is developed is influenced by the global food system (Pollani, 2008). What is grown influences the food chain and eventually actual meals: if monocultures of corn and soy are grown, the products of processed corn and soy will be presented for eating (Pollani, 2008).

Food is the first human connection with nature, body, soul and community. How are healthy choices made in this food market in which some have too little and others live in abundance? How can children be taught in school to develop a healthy relationship with food and one in which they can make conscious choices in a global food system even if food is not always available? Teaching about food, through food e.g. gardens and farming, in food insecure areas is important but also holds ethical dilemmas of teaching information that cannot be used at that particular moment but might be relevant in the future. Education is able to contribute to increasing food security and decrease the loss of soil and misallocation of food by teaching children to be conscious producers and consumers.

Figure 1: Map of Ethiopia Source: www.africa.upenn.edu



1.2.2 Rationale of the research

This research reviews two schools in Tigray in Northern Ethiopia to determine to what extent nutrition education is integrated with feeding schemes and the school gardens. Principals of 12 other schools have been interviewed about the subject so I visited a total of 14 schools. With my research I attempt to contribute to knowledge about how to teach food in a sustainable, integrated way.

This study attempts to contribute to literature about the integration of school gardens, food curricula and feeding schemes in Africa and particularly Ethiopia. Until now, little literature has focused on the integration of the three in Africa.

1.2.3 Personal motivation

Creating a more sustainable world is talking about the future. The future lies in the hands of children. We should try to equip them for the future so they will be able to make conscious choices. Conscious choices about the food they want to eat, how they want to produce it and from where they want to purchase it. Education can and should contribute to a sustainable world.

Before I came to South Africa to study at the Sustainability Institute I worked at an educational project in the Netherlands, my home country, aimed at equipping children to believe in their dreams and possibilities for the future. I love to work with children because of their energy, creative minds and the opportunities they give you to learn about yourself by giving you a mirror of your being.

For my International Relations BA at the University of Amsterdam I did an internship with Bustan, an Israeli NGO that works to improve the social and environmental situation in the Negev desert. It was there I got the inspiration to continue in the field of sustainable development. Balancing social, ecological and economic factors is in my view key to create a better world, which is the greatest challenge, we, as habitants of this planet, face.

To challenge myself and see the world from a different perspective I wanted to study this in Africa at the SI. In my opinion, to improve the equality of the world we should break free of the traditional paradigm of developed and developing countries; and encourage ourselves to learn from each other. I was impressed by the transdisciplinary approach of the SI and wanted to experience practical learning combined with high academic learning; a concept that is familiar to me from my education at the Waldorf School.

After finishing my PGD at the SI in South Africa, I wanted to study in another African country to get to know the continent better and apply my knowledge in a different setting. The research funding of the National Research Fund (NRF) made it possible to fulfil this dream and continue my learning about building a more sustainable world in one of the most unique societies in the world. I lived for six

months (March till August 2013) in Mekele, North Ethiopia and researched the role of food and learning about food in schools.

Ethiopia is a very unique country and very proud of the fact that they have never been colonized. I loved the challenge of living in such a different place where you experience what it really means to eat locally produced food and where communication between people is mostly on a different, indirect level. There is an interesting mix between mainstream development and one that follows its own path.

The people are friendly and very hospitable which made my research experience very positive. Even when we just arrived at the schools without notice, they always made time for us and were willing to participate in the research. On the other hand, the people are not very direct and would not easily say what they really think about you or the issues you present. The government is also very much in control so not everybody feels free to be critical of the state or big organisations.

I hope this research will contribute to sustainable education and provide inspiration for creating transdisciplinary learning about food which integrates the school garden, nutrition curriculum and feeding scheme. The story of the schools shows how they try to teach their students about food. It is a real story, rather than an ideal one, which hopefully gives inspiration that change, is possible also with limited resources. The following description of a teacher at Qihen Primary School of her motivation to create the school garden demonstrates this very clearly:

“The students see how a desert area can turn green: change can happen; also in their own life” (F. Hafteaggu, 14 May 2013).

1.3 Research Question

To what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

1.4 Research Objectives

The following research objectives are determined to answer the research question:

- Explore food and nutrition education in Africa, with a special focus on school feeding programmes Ethiopia, as well as challenges and achievements of school feeding programmes;
- Describe examples of education programmes which integrate school gardens, school feeding and nutrition programmes, recognising the importance of sustainability;
- Investigate the status of school gardens, feeding scheme and nutrition curricula in schools in Tigray, Ethiopia through interviews with different actors and school visits;
- Present a case study of two schools each which have a school garden and investigate to what extent each one utilises the school feeding programme and school garden to integrate food and nutrition studies into the curricula; and
- Attempt to make useful recommendations that may influence further study in this arena.

The first two objectives will be addressed in Chapter 2, the literature review. The third objective will be addressed in Chapter 4 entitled ‘the role of food in schools in Tigray’ through interviews with different stakeholders around the schools such as the Tigray Bureau of Education and NGOs. The fourth objective will be addressed in Chapter 5 which gives a detailed overview of the visits of 14 schools and two in depth case studies. The fifth and last objective will be addressed in Chapter 6 in which the conclusion of this research is described and recommendations for further study are given.

1.5 Value and Relevance of the Study

The research is intended to contribute to the work of educators, developers of nutrition curricula, organisers of feeding schemes and developers of educational

projects in Africa. It is also intended for academics in the field of sustainability and education, with a particular interest in Africa and Ethiopia.

1.6 Introduction to Research Design and Methodology

The research will be done with complexity theory as a theoretical framework, using a systems thinking perspective. It is qualitative research which makes use of an in-depth case study. It contains a comprehensive literature review of academic journals and grey literature in English. The case-study will take place at two schools in Tigray, Northern Ethiopia and contains interviews with different stakeholders, observations and surveys. In Chapter 2 the research design and methodology will be explained in detail.

1.7 Research Strategy

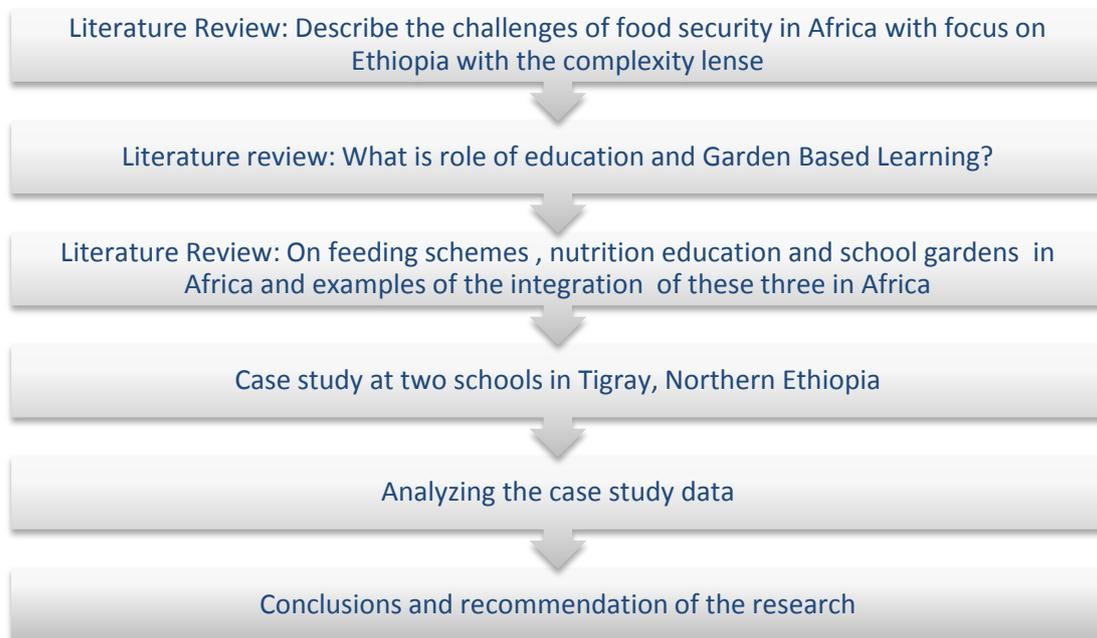


Figure 2: Research strategy

1.8 Limitations and assumptions of the study

In this section the limitations and assumptions associated with this study are articulated.

Assumptions:

- Learning by doing and practical learning is effective; for example the use of school gardens;
- The integration of feeding schemes and nutrition education is a positive development and increases the efficiency of learning about food;
- It is important to teach children about food and nutrition; and
- Feeding schemes are an efficient solution for children that are challenged by food insecurity.

Within the literature review I will give attention to these subjects to support them and/or reject them with previous research results; so the academic debate will be demonstrated from different points of view.

Limitations:

- Good cooperation with the school is necessary to make the research possible;
- Access with the different stakeholders in Ethiopia is very important. I participated in an exchange programme with Mekele University and therefore had good access to the different stakeholders including the Department of Education;
- The language spoken in Tigray, Northern Ethiopia, is Tigrinya. Many officials and teachers do speak English because secondary and tertiary education in Ethiopia is officially in English; but the level is not always fluent; therefore I worked with an interpreter when visiting the schools;
- Doing research as a Dutch person in Ethiopia will give an extra dimension to the research and present cultural challenges; and
- Literature regarding developing countries focuses more on school feeding rather than education about nutrition. This might be a challenge for the research but at the same time it shows the relevance of it, because there is room for further academic and practical insight.

1.9 Ethical implications of the research

The literature review for this research had a low ethical risk because I used literature sources that are open for the public.

The case study is considered low risk. I followed all the required steps of my department regarding the ethical permission of this research with full approval.

All participants took part in the research on a voluntary basis, including participating in questionnaires, interviews and observations and all the material was read and approved before publication (Mouton, 2001). This was made clear to all participants.

The relationship with the schools has to be clear, transparent and open. It will be made clear that the results of the research can be critical, but always respectful. The schools will be allowed to read everything before publication and possibly reject parts of information from being published (Mouton, 2001).

1.10 Outline of Chapters

Chapter 1: Introduction

Chapter 2: Literature Review

Chapter 3: Research design and methodology

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1.11 Summary

In order to create a food secure world, it makes sense for children to learn about food, through experiencing food. This research focuses on the integration of school gardens, feeding schemes and nutrition curricula in the Tigray region in Northern Ethiopia. This research attempts to contribute to sustainable curricula about teaching food to children, so they experience and learn to make conscious choices about food, are empowered to grow it themselves and develop optimally in every way because of the availability of food during their schooling. Hereby taking in consideration that teaching about food in food insecure areas raises ethical dilemmas about the availability of choices and food that the children will learn in class. Chapter 2 will give an overview of the literature regarding this subject.

Chapter 2: Literature Review

2.1 Introduction

This chapter attempts to lay out the theoretical framework for the argument of integrating school gardens, feeding schemes and nutrition curricula in ways that form a foundation of sustainability for uncertain futures.

Underpinning this research is a systems and complexity theory perspective; starting with a philosophical introduction on how life sustains itself. Then, through the capability theory of Sen, I will explain how a particular focus on nutrition increases the capabilities of children. The following section focuses on food security in order to form an overview of the effects and the current situation in Africa and Ethiopia. In order to gain a better understanding of education in Ethiopia the history, trends and challenges with mal- and under nutrition are described followed by sections about nutrition curricula and feeding schemes in Africa and Ethiopia in particular. Further to this, it is core to my argument to lay out different ideas about sustainable education and garden-based learning. The closing section gives examples of gardens for education and feeding and research about it.

The following research objectives will be addressed in this chapter in order to answer the research question: to what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

- Explore food and nutrition education in Africa, with a special focus on school feeding programmes Ethiopia, as well as challenges and achievements of school feeding programmes;
- Describe examples of education programmes which integrate school gardens, school feeding and nutrition programmes, recognising the importance of sustainability;

2.2 *How life sustains itself*

“To be is to be related...”

(Swimme & Berry, 1992:77 in Williams and Brown, 2011).

In order to understand the interlinked crises that we are facing today leading to rising food and fuel prices, declining biodiversity and climate change, Capra argues that we need to become ‘ecological literate’ and have to start thinking in systems and relations, patterns and context (Capra, 2009).

To make his point, Capra starts with the one of deepest questions we can ask; what is life? It has been called the ‘breath of life’ by poets but in modern science the process of life is called ‘metabolism’; which marks the difference between a living organism and a dead organism (Capra, 2009). Metabolism is about the intake and transformation of food. Important to realise is that it is not a static process; through connected chemical reactions, a living organism is constantly generating and repairing itself (Capra, 2009). Within the broader system of metabolic processes, structures and evolution of species, our biosphere has sustained life for billions of years. How does nature sustain life (Capra, 2009)?

Nature sustains life by creating and nurturing communities, co-existing and sustaining each other; organisms cannot exist in isolation. ‘Ecological literacy’ means knowledge of this web of life, of these principles of organisation of the earth’s ecosystems (Capra, 2009). For example by studying soil, the living skin of the earth, we will be able to unlock the secrets of sustainable life (Williams and Brown, 2011).

Children according to Capra should be taught this interdependency of species; the importance of networking and that diversity assures resilience. Children are capable of internalizing that the way to sustain life is to build and nurture communities which are related to other communities, both human and nonhuman (Capra, 2009). Sustainability should also encourage the flourishing of differences in children and young adults (Williams and Brown, 2011).

The food web is an example of an ecosystem in which each species contributes to its sustainability; and the more diverse it is, the more resilient it is against shocks (Capra, 2009). *'Diversity is not only a value of life, it is life'* (Williams and Brown, 2011:7). The stability of the ecosystem depends on its biodiversity, i.e. on the complexity of its network of relationships (Capra, 2009).

'Anything that we can destroy but are unable to make is, in a sense, sacred, and all our 'explanations' of it do not really explain anything' (Schumacher, 1977:17).

Schumacher describes the differences between minerals, plants, animals and humans. Minerals and plants are clearly alive but it is difficult to define what it means exactly. Humans can take this life away but cannot create it (Schumacher, 1977). Our food are animals and plants (environmental science curriculum Tigray); this simple observation connected to the quote of Schumacher makes one realise that we eat living organisms which are sacred to us because we can take their life but not create it.

2.2.1 System thinking and complexity theory

"When we try to pick out anything by itself, we find it hitched to everything else in the universe"

(John Muir, 1911:326 in Williams and Brown, 2011).

In Western culture humans see themselves separated from nature (Harding, 2006). Harding (2006) argues this started in ancient Greek where Plato described a dualistic view of the world where men and nature are separate, which was later adopted by the Christian church. The scientific revolution (16th-17th centuries) intensified the separation from nature in the western world (Harding, 2006).

By colonizing most of the world, the western culture spread this dualistic view of seeing nature and human as separate entities; but we need the knowledge based on a holistic worldview to develop a sustainable way of living (Harding, 2006). Modern scientific methods, based on Newton's reduction theory, take a system apart to analyse every element individually in order to analyse the entire system (Heylighen,

Cilliers and Gershenson, 2007; Capra 2009 and Shiva, 2013). Holistic science should be encouraged, where there is a balance between thinking, intuition, feeling and sensing (Harding, 2006).

Systems thinking are based on the philosophy that '*the whole is greater than the sum of its parts*' (Capra, 1996; Rountree, 1977; Cabrera, Colosi and Lobdell, 2008). Each part of the system affects the system as a whole and each part of the system depends on the whole system (Rountree, 1977). Determinism and holism are the basis of the philosophy with the constantly changing networks and relation between the different actors in the field (Capra, 1996). A system cannot be studied by considering the components in isolation because it is the inter-relationships and interactions of the components which produce its organisational integrity and identity (Rountree, 1977). Systems thinking can be used in all disciplines; it is a pattern of thinking that transforms the meaning of content (Cabrera *et. al.*, 2008).

System theories require a paradigm shift in modern education and academics; which is based on determinism and objective information (Capra, 2009). Things needed to be measured and weighed while relationships need to be mapped. This means a shift from objective knowledge to contextual knowledge (Capra, 2009). Capra argues that we cannot understand the challenges of today in isolation; these are systemic problems, which means that they are all interconnected and interdependent (Capra, 2009).

Complexity theory is relevant in this increasingly global world in which production becomes more efficient and we continuously interact with more people, driven by a globalizing economy (Heylighen, Cilliers and Gershenson, 2007; Allen, 2011). Complexity science considers an ontology of connected entities, i.e. a network which has links that change, nodes that change internally, and capabilities that develop and change over time (Allen, 2011).

Complex systems consist of a large number of elements that interact dynamically, non-linearly and change with time (Preiser, Cilliers and Human, 2013). There are loops in the interactions; these feedback loops can be positive (enhancing and stimulating) or negative (detracting) (Cilliers, 2006). Complex systems are usually open systems, i.e.

they interact with their environment. As a matter of fact, it is often difficult to define the border of a complex system (Cilliers, 2006).

Doing research in this complex world means that you have to be aware of the context and of your own perceptions and person and the influence on your research (Montuori, 2013). Audouin *et.al.* (2013) point out that every research needs artificial borders and simplified models of reality in order for understanding (Audouin, Preiser, Nienaber, Downsborough, Lanz, and Mavengahama, 2013). A complexity theorist agrees on the impossibility of full understanding of this complex world (Montuori, 2013; Audouin *et. al.*, 2013). The challenge is to keep the complexity of reality in the research while on the other hand border it and simplify reality in order for understanding (Montuori, 2013; Audouin *et. al.*, 2013).

The living system theory is closely related to systems thinking and complexity theory but it emphasises that living systems such as cells, plants, people, corporations, schools, watersheds, and economies; significantly differ from mechanical systems and demonstrate properties, patterns and processes (Barlow and Stone, 2011). The living system theory influences the way decision-making, change of social systems and leadership strategies will happen (Barlow and Stone, 2011).

The food system is characterised by a pattern of complex systems in which systems at one level are included in systems at other levels (Barlow and Stone, 2011). Change, from a system thinking perspective, will happen when issues are addressed from multiple levels and directions: bottom up, top down, inside out and outside in (Barlow and Stone, 2011). This is clearly a tall task, and requires dedication across stakeholders, derived from adequate social prioritization.

'Systems thinking and ecological literacy are two key elements of the new paradigm, and very helpful for understanding the interconnections between food, health, and the environment, but also for understanding the profound transformation that is needed globally for humanity to survive' (Capra, 2009:248)

Systems theory underpins this research in two ways. Firstly, the paradigm from which reality is interpreted which is very useful in order to analyse the complexity of the

current global food system (Barlow and Stone, 2011). The second it is that is closely related to education for sustainability; and several authors argue (Barlow and Stone, 2011 and Capra, 2009) that children should be taught in systems and relations in order to understand this increasingly complex world. Food connects all life. From a systems thinking perspective it is therefore logical to link nutrition education, school garden and school feeding; to teach the connection, the system, the food web, and to teach children one message of patterns, relations and linkages.

2.2.2 Definition of sustainable development

“Loving all children of all species of all times”

(McDonough, 2010 in Widhalm, 2011:2)

Sustainable development has always been part of nature and indigenous communities (Harding, 2006). Self -sustaining systems, which are able to anticipate changes, are found everywhere in nature (Mebratu, 1998). People have collectively managed natural resources over time by making use of sustainable methods (Pretty and Ward, 2001); but due to the separation of human and nature; the Western world started to exploit nature instead of living in balance with nature (Harding, 2006).

Interest in sustainable development and sustainability in the Western nations start to rise in the seventies of the 20th century. The awareness of the limits of resources rose and the debate started (Hattingh, 2001; Elliot, 2006). In 1987 the Brundtland report published the most used definition of sustainable development:

‘Sustainable development is development that meets the needs of present generations without compromising the ability of future generations to meet their needs’ (Our common future, 1987:43).

This definition is very broad and has led to many different interpretations (Smith *et. al.*, 2011). Roughly the debate can be divided in two approaches, differing in their basic view of the world. The anthropocentric or technocentric approach; in which humans manage the resources of the world for their own benefits and focus mostly on the sustainability of the social, or socio-economic system; and the eco-centric

approach where humans are part of the wider system of the earth in which everything is valued and the connection with earth and nature is very important (Gallopín, 2003; Elliot, 2006). In between these two approaches there is a wide variety of interpretations (Elliot, 2006 and Blewitt, 2008). Blewitt gives a comprehensive overview of the different approaches (Blewitt, 2008).

Often sustainability is divided into economic, ecological, and social dimensions (Smith, 2011; Lehtonen, 2004; Elliot, 2006; Burford, Hoover, Velasco, Janoušková, Jimenez, Piggot, Podger, and Harder, 2013). How these three areas relate is influenced by the approach taken in the ecocentric versus anthropocentric debate (Elliot, 2006; Smith, 2011). The following two graphs show these different approaches. The graph on the left shows that sustainable development takes only place when the three areas are balanced, so on the inner area where the three circles meet. The second graph shows that humans function within nature and economy functions within human society and these relations should be balanced (Smith, 2011).

Figure 3: Two examples of definitions of sustainable development (Smith, 2011):



The emphasis is placed on balancing and trading off between environmental, economic, and social sustainability (Smith, 2011). Lehtonen critiques that there is no guidance given on how to synergize these three different areas (Lehtonen, 2004). Cabrera *et. al.* (2008:300) suggest that systems thinking can provide this guidance as it is “*interdisciplinary and may act as a bridge between the physical, natural, and social sciences*” in order to integrate the three areas instead of a trade off (Cabrera *et. al.*, 2008 and Smith, 2011).

The social pillar is often seen as the one least developed because of its difficulty to measure it with scientific methods (Lehtonen, 2004). Lehtonen purposes two different methods based on social capital and the capability theory of Amartya Sen (Lehtonen, 2004). Dahl (2012) shows in his article how institutions on different levels develop indicators of sustainability within the complexity of global, national and individual levels which influence each other's possibilities of living sustainably (Dahl, 2012).

There is an ongoing debate about a fourth pillar; suggested are culture, ethics, politics, education, religion and spirituality or a combined pillar with these subjects (Smith, 2011; and Burford *et. al.*, 2013). Burford *et. al.* (2013) give in their article an overview of different organisations conceptualizing this pillar. For example UNESCO promotes the cultural perspective, particularly within the context of Education for Sustainable Development (ESD), where it focusses on acknowledging and respecting diverse worldviews, identities and local languages and promoting open dialogue and debate (Burford *et. al.*, 2013). The United Nations Permanent Forum on Indigenous Issues has acknowledged the need for culturally appropriate indicators of well-being and sustainability that reflect indigenous perspectives such as portraying approaches grounded in wholism (Burford *et. al.*, 2013). They argue that this pillar is based on values and ethics, and put efforts to develop concepts for measurement (Burford *et. al.*, 2013). Bosselmann, Brown and Mackey (2012) note that sustainable development should be underpinned by an ethical framework of shared values instead of an apart pillar. They focus in particular on the economic pillar and how to create a sustainable economy where business is done ethically (Bosselman *et. al.*, 2012).

Marshall *et. al.* (2010) contribute to the debate on how business schools can teach and integrate sustainability (Marshall, Vaiman, Napier, Taylor, Haslberger, and Andersen, 2010). Their focus is how to develop questioning amongst students rather than the focus on knowing what needs to be known. *“Only with enduring questioning, life-long pursuit of new insights, and continual adaptive change, are college graduates able to contribute to and partake in the paradigm shift of sustainability.....how to empower students to leave our halls as question marks and effectively participate in the sustainability transformation”* (Marshall *et. al.*, 2010:477).

‘Sustainability does not mean that things do not change; it is a dynamic process of co evolution rather than a static state’ (Capra, 2009:8).

How can children be educated for this dynamic process towards sustainability? Capra argues system theories and complexities have to be part of education; children have to be taught to think in relations and networks in order to be able to understand this complex world (Capra, 2009). In section 2.7, Education for Sustainability this will be addressed more deeply.

2.2.3 Expanding capabilities

Nobel Prize winning economist, Amartya Sen explains with his Capability Theory clearly how the focus of development should lie on the increase of capabilities rather than the increase of resources (Sen, 1999; Nussbaum, 2003; Lehtonen, 2004; Nussbaum, 2011). The question people can ask themselves is very simple and concrete: *‘What am I able to do and be?’* (Nussbaum, 2011:29). Focus on the development of capabilities within individuals and communities leads to improved, and more equally distributed abilities to utilise resources (Jukes, Drake and Bundy, 2008). Both when nations are compared internationally and internally, thinking of development’s goal as increase in GNP per capita excluded distributional inequalities (Nussbaum, 2003). By improving the capabilities of the people a more individual approach is taken; the focus should lie on building individual capabilities in order to create freedom of choice (Lehtonen, 2004).

Resource-based views of development which promote expansion of available resources such as income will increase inequality (Jukes, Drake and Bundy, 2008). An equal distribution of resources does not guarantee an equal outcome because for the advantaged it will be easier to utilise the extra resources provided (Jukes, Drake and Bundy, 2008). Extrapolating capabilities theory to school feeding schemes, the focus on school nutrition will increase the capabilities of all children where many educational interventions such as textbook provision seem to benefit especially the advantaged children. Better nutrition and knowledge thereof will improve children’s capabilities to benefit from education with a focus on the least capable students who usually benefit most from improved nutrition (Jukes, Drake and Bundy, 2008).

With improved nutrition, children will have a better platform to concentrate and therefore benefit more from other educational interventions; so the decrease of inequality of capabilities will also lead to reduced inequalities in the use of resources (Jukes, Drake and Bundy, 2008). Capability theory helps explain why nutrition is such a powerful tool for leveling the playing field (Jukes, Drake and Bundy, 2008).

2.2.4 Ecoliteracy

‘We are made of the same five elements – the Panch Mahabhutas – earth, water, fire, air and space – that constitute the Earth. The food that is produced by the soil and the sun’s energy becomes our cells, our blood, and our bones. Biologically and ecologically we are one with the Earth. It is the disease of separatism and eco-apartheid that denies it and then creates the diseases of loneliness, depression and alienation’ (Shiva, 2013:96).

Shiva refers with eco-apartheid to the illusion of separateness between humans and nature based on the mechanical, reductionist worldview that started in the 17th century (Shiva, 2013). In order to reconnect with Mother Earth according to Shiva, we must recognise that we are part of the web of life and this will involve a shift from fragmentation and reductionism to interconnectedness and holistic thinking (Shiva, 2013). *“A world in which we do not allow for our hearts and souls to reconnect cannot become a sustainable world”* (Widhalm, 2011:15). Shiva (2013) argues we need a new paradigm for living on the Earth, one in which we ask ourselves as humans what our aim on this world is. The more we respect the Earth, the more she will provide us with our needs. The more bio diverse a system, the more nutrition and health per acre, and the more wealth per acre for farmers it is able to produce and systems will increase resilience in times of climate chaos (Shiva, 2013).

Food serves as an ideal entry point for understanding the interrelations of such issues as hunger, trade policy, energy use, and climate change (Center for Ecoliteracy, 2010). To understand these cycles and create ecologically sustainable communities the basic principles of ecology have to be understood; we have to become eco-literate. An important place to acquire ecoliteracy is the school garden. Gardening makes the

web of life, the flow of energy and the cycles of nature understandable (Capra in Barlow, 2007).

Capra (1996) defines ecoliteracy as an understanding of the principles of the organisation of ecosystems and the application of those principles for creating sustainable human communities and societies. The idea of using resources in such a way as to ensure future availability is an essential element of ecoliteracy (Capra, 1996). Capra was inspired by the work of Orr (1992) who was the first one to include sustainable communities into environmental literacy (McBride, Brewer, Berkowitz, and Borrie, 2013).

An ecoliterate person is prepared to be an effective member of a sustainable society, with well-rounded abilities of head, heart, hands, and spirit, comprising an organic understanding of the world and participatory action within and with the environment (Mcbride *et. al.*, 2013). One that supports a paradigm in which *human systems are nestled within natural systems* (Barnes, 2013). A strong sense of personal awareness and appreciation for all life on Earth is essential in order to embracing personal responsibility and action *for the long haul* (Barnes, 2013). Ecoliteracy is not only about the rational knowledge of ecosystems but also feeling connected to them with all senses and feeling the deep responsibility to connect and care for them (Widhalm, 2011; Hampson, 2011; McBride *et. al.*, 2013; Barnes, 2013). Ecoliteracy involves experiencing with our hearts and souls, as well, because as agents in a rapidly changing and unpredictable world, we require all the adaptability, emotional intelligence, and co-creativity we can master (Widhalm, 2011).

In this first section of the literature review the theoretical framework of this study has been set up. Systems thinking and complexity theory explain the urgency of thinking in systems and relationships in this increasingly complex and global world. This section was followed by a definition of sustainable development; capability theories and ecoliteracy. The next section is about the global food crisis; the polycrisis and the current status of food security in Africa and Ethiopia.

2.3 *Global food crisis*

2.3.1 Polycrisis

The global food system is unbalanced. There is enough food produced in the world but it is not well allocated and as a result many people in the world suffer from hunger and food insecurity (Pollani, 2008). The food system is challenged by various factors such as unsustainable production, unfair allocation of food, rising food prices; rising fuel prices and unhealthy personal choices about food (Dahl, 2012).

The world is starting to feel the effects of this unbalanced system; in 2008 several crises appeared. First the food crisis, particularly threatening to poor consumers and especially in Africa, followed by a record increase in oil prices and finally the global economic downturn (Sen, 2009). Since 2007–08 global progress in reducing hunger has slowed and leveled off (FAO, WFP and IFAD, 2012). These crises relate directly to two underlying primary resources – oil and soil, and the timing and circumstances of their appearance show us how these crises are interlinked (Swilling and Annecke, 2012). The world is in a polycrisis, in which cause-effect relationships are unstable and uncertain (Swilling and Annecke, 2012).

The rising oil prices were a key driver for the rising food prices, because conventional agriculture depends heavily on chemical fertilizers and herbicides made of oil (Swilling and Annecke 2012). Speculation in commodity prices, which grew following deregulation on the financial market, pushed food prices up (Cramer, Johnston and Oya, 2009), as did the growing demand for food due to a growing world population (Pollani, 2008).

Another way of explaining the current global sustainability challenges is by the transitions of socio-metabolic regimes that currently take place (Haberl, Fischer-Kowalski, Krausmann, Martinez-Alier and Winiwarter, 2011). Haberl *et. al.* (2011) define three socio- metabolic regimes: hunter-gatherers, agrarian societies and industrial society. Two-thirds of the world population is currently within a rapid transition from the agrarian to the industrial regime (Haberl *et. al.*, 2011). They also argue that industrial society is as different from a future sustainable society as it is

from the agrarian regime, so a sustainable future requires a fundamental re-orientation of society rather than only more eco- efficiency (Haberl *et. al.*, 2011).

Along with these causes - the rising oil prices, financial crisis and a growing consumer demand, there is another, very important and often overlooked factor of the food crisis: the degradation of soil. Global soil degradation has a negative effect on crop supply and is too often left out of the debate, even though its effect on food security is immense, as is climate change and the loss of biodiversity (Swilling and Annecke, 2012).

2.3.2 Food Security

Rising fuel and food prices, degradation of soils, loss of biodiversity and climate change are all factors which have a negative impact on the fragile food system in Africa (Mulugeta, Hagos, Kruseman, Linderhof, Stoecker, Abraha, Yohannes and Samuel, 2010). Almost 40 per cent of the children in sub-Saharan Africa are stunting (FAO, 2013). In developing countries an estimated 60 million children go to school hungry every day (Bundy, Burbano, Grosh, Gelli, Jukes and Drake, 2009). About 40 per cent of these children live in Africa (Bundy *et. al.*, 2009).

The most common definition used of food security is from the UN Food and Agriculture Organisation's (FAO) which states that food security exists:

'When all people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary need and food preferences for an active and healthy life' (FAO 1996 in Frayne, Moser and Ziervogel, 2012:20).

Not addressed in this definition is the notion of sustainable food production. In its 2020 Vision, the International Food Policy Research Institute (IFPRI) comes therefore with an alternative definition of food security:

'A world where every person has access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective, and low-cost food systems that are compatible with sustainable use of natural resources' (Frayne, Moser and Ziervogel, 2012:20).

Both definitions make clear that it is important to look at both the supply side and the demand side (Frayne, Moser and Ziervogel, 2012).

Food security should be addressed on different levels: global, regional and national as well as on the household and community level. Globally, the responsibility of climate change implication management is a major player in the risk control of major disruptions in food supply, and thus a major influence to food security everywhere (Frayne, Moser and Ziervogel, 2012). On a regional and national level, production and import of food should be maintained at a set of economic terms that ensure feasibility and access. Finally, the community and household also play an active role: to maintain livelihoods that allow production/procurement of food; to increase productivity and to make sure there is an equitable gender and inter- and intra-household distribution (Tansey, 2008).

2.3.3 Food security in Ethiopia

Ethiopia has been struggling with food security for many years (WFP-Ethiopia, 2009). Many Ethiopians live in conditions of chronic hunger with both a low average daily energy supply (kcal/capita/day) of 1880 and a very high (44 per cent) prevalence of undernourishment (Van Der Veen and Tagel, 2011). In Ethiopia 29 per cent of the children are underweight, 44 per cent stunted and 10 per cent wasted; this makes it one of the countries with the highest numbers of undernutrition (Saldanha, Buback, White, Mulugeta, Mariam, Roba, Abebe and Mason, 2012; FAO, 2013).

The economy depends on agriculture; 47 per cent of the GDP comes from agriculture (WFP-Ethiopia, 2009). Agriculture is mainly rain-fed which increases the vulnerability for varieties in the climate; not more than 10 per cent of cereal croplands has been irrigated (WFP-Ethiopia, 2009). As a result of droughts the farm production can be 90 per cent less compared to a year with normal rainfall (WFP-Ethiopia, 2009). In years with droughts the people who need food aid can be over ten per cent of the population; it can rise up to 14 million people (Saldanha *et. al.*, 2012).

Ethiopia has a long history of famines and food shortages; some have cost the lives of about a million people and can be traced back to 250 BC (Van Der Veen and Tagel,

2011). The fluctuation of yields because of droughts has been the major cause of food insecurity in Ethiopia (WFP-Ethiopia, 2009). Others would debate this and say that also political, social and economic factors play a role. For example the food crisis in 2002–2003 has been evaluated to be the result of both political, social, and economic factors rather than only the result of environmental stressors leading to production shortfalls (Van Der Veen and Tagel, 2011). Also land degradation causes poverty and food insecurity; low agricultural productivity, poverty, food insecurity, and land degradation are interconnected problems in the Ethiopian highlands (Van Der Veen and Tagel, 2011).

Tigray is one of the regions most affected by food insecurity. Despite efforts being made and some signs of change, poverty and food insecurity remain high (Van Der Veen and Tagel, 2011). Underlying causes of food insecurity are rapidly increasing population pressure, widespread environmental degradation, recurrent drought, low productivity of the agricultural sector, and limited market access (FSiAbd report, 2012). Most of the arable land lacks adequate irrigation. Many farmers, even during normal rain season, cannot produce enough to cover their subsistence needs (FSiAbd report, 2012). Food or cash assistance is, therefore, relied on to fill the food gap. In 2011; 1.4 Million people in Tigray were getting food /cash assistance through the Productive Safety Net Programme (PSNP); and in addition 400,000 people in Tigray were supported through emergency food assistance (FSiAbd report, 2012).

Since 2005 there has been a huge inflation on food prices in Ethiopia and Tigray in particular. Food insecurity increased in urban areas, the prices of cereals increased by 100 per cent since mid-2005 (WFP-Ethiopia, 2009). The government initiated an urban grain market stabilization programme in 2007 to increase the food security in urban areas (WFP-Ethiopia, 2009). The WFP gives two main reasons considered responsible for the steep increase of food prices; the first is opportunistic traders, brokers and farmers who took advantage of the situation and made food commodities scarce by hoarding and created irregularities in food markets resulting in poor supply, high demand and higher prices. The second reason is the increase of fuel prices which led to higher transport costs (WFP-Ethiopia, 2009). The reaction of households was to skip meals, reduce the size of the meals and choose cheaper food items (WFP-Ethiopia, 2009). The steep rise of food prices especially affected the food security of

urban areas where as usually in Ethiopia the rural areas were more threatened by food insecurity. This is still true but different dynamics in the market mean that food security in urban areas is also a challenge (WFP-Ethiopia, 2009).

Food insecurity leads to complicated problems in society as shown by research done in Tigray. Relationships come under stress and divorce significantly increased. People have to sell their belongings like furniture, jewellery and sometimes even their productive assets (WFP-Ethiopia, 2009). Food becomes a disproportional part of the income which means that there will not be enough money for example for clothing and healthcare (WFP-Ethiopia, 2009). An increased number of students dropped out of school because they were forced to look for casual labour and save money on education. The most affected were households headed by the elderly and children as well as low income groups like daily labourers, pensioners and immigrants from Eritrea (WFP-Ethiopia, 2009).

2.3.4 The effects of food deficits

Research by Whaley *et al.* shows the importance of adequate food for the ability to learn (Whaley, Sigman, Neumann, Bwibo, Guthrie, Weiss, Alberz and Murphy, 2003). There are significant associations between malnutrition and the cognitive and behavioural development of children. School-aged children who suffer from severe malnutrition have poorer school grades, reduced attentiveness and unresponsive play behaviour, compared to their adequately nourished peers (Whaley *et al.*, 2003; Bundy *et al.*, 2006; Acham, Kikafunda, Malde, Oldewage-Theron and Egal, 2012; FAO, 2013). In addition, children suffering from mild-to-moderate malnutrition, a condition that affects over 30 per cent of the world's children and occurs in both developed and developing countries, show significant deficits in intellectual and behavioural functioning (Whaley *et al.*, 2003). School health and nutrition interventions can add four to six points to IQ levels, 10 percent to participation in schooling, and one to two years of education (Bundy *et al.*, 2006).

The most important documented forms of malnutrition in Ethiopia are protein energy malnutrition and vitamin A, iodine, iron and zinc deficiencies (Mulugeta *et al.*, 2010;

Ministry of Education Ethiopia, 2012). 75 per cent of the children in Ethiopia suffer from anaemia; 46 per cent have a vitamin A deficiency and 68 per cent have iodine deficiency (FAO, 2013). According to the Ministry of Education there is also little awareness of the effect of poor health and nutrition on children's ability to learn in Ethiopia (Ministry of Education Ethiopia, 2012).

Malnutrition has effects on physical growth, morbidity, mortality, cognitive development, reproduction, physical work capacity and risks for several adulthood chronic diseases (Mulugeta *et. al.*, 2010; FAO, 2013). The nutritional status of pre-school and primary school-aged children impacts their school attendance and educational achievement (FAO, 2013). So school feeding programmes should also be designed to support nutrition issues for example by providing micronutrient fortification and bio fortification of food (WFP, 2013). Hook worm infection, one cause of iron deficiency anaemia and malnutrition, is also linked to diminished learning capacity; so deworming programmes should be developed in addition to nutrition interventions (Acham *et. al.*, 2012; WFP, 2013).

Under- and malnutrition have effects in several areas of the development of the child and later the adult. Research done by Dercon and Sanchez (2011) shows that children stunted at an early age behave differently to non-stunted children, being generally less sociable, more apathetic and less willing to explore when they are very young; this consequently develops to behavioural problems later on. It effects the long-term cognitive implications as well as the non-cognitive skills (Dercon and Sanchez, 2011). The influence of mal-nutrition on the development of non-cognitive skills is a relatively new field of research. The research has been done in Ethiopia, India and Peru and shows a positive correlation between height-for-age measured for 7/8 years old compared with the non-cognitive skills measured during the age of 11/12 (Dercon and Sanchez, 2011). Nutrition programmes should focus on the first 1,000 days of life – from conception to two years of age – because nutrition intake for development of the body and brain is most important in that period (WFP, 2013).

Ethiopia has invested heavily in national programmes and both underweight and stunting show improving trends. The government formulated a National Nutrition Strategy in 2005-6, which brought various uncoordinated nutrition programmes into

one comprehensive framework and started a transition from food-based emergency programming to a more development-oriented approach. This is now being implemented through the National Nutrition Programme (NNP), 2008-2013 (Saldanha *et. al.*, 2012).

2.4 Education in Ethiopia: history and trends

2.4.1 History of Education in Ethiopia

Traditionally, education in Ethiopia was organised by the monasteries, churches, and mosques; they taught reading, writing, the sacred music of the church, poetry, grammar, *Qene*¹, history, law, administration, basic numeracy and religious paintings (Faris, 2012). Students moved from monastery to monastery in search of a special teacher on their level or in preferred subject. The students had to raise funds for their teachers, by going around the community asking for bread and any food for their teachers (Faris, 2012).

Modern education began in Ethiopia in the beginning of the 20th century, when the then Emperor Menelik opened the first formal school, taking off from the indigenous religious schooling system (Faris, 2012). Menelik's aim was primarily to create a potential workforce of foreign language translators and bureaucrats to fill posts in newly opened government structures such as the Postal and Railway Authorities. Such positions required literacy at a basic level (Faris, 2012). Over the next 100 years, led by economic and political interests, foreign countries dominated education in Ethiopia—France (1910 to the 1920s), Italy (1930s), Britain (1940–1950s), United States of America (1960s), Russia and Germany (then East Germany) (1970–1980s), and currently a mix of USAID, World Bank and EU member countries (1990–2000s) (Faris, 2012).

Faris states the complex reality of education in Africa as it is dominated by Western education. *‘The failure of education in Ethiopia and generally in Africa can be*

¹*Qene* is an Ethiopian style of speech, in which one says one thing while implying something different at the same time and in the same sentence, as in a play on words. It depends on a word being interpreted in more than one way.

ascribed to its inability to understand the nature of human beings within their own environmental and cultural context' (Faris, 2012:34). Tedla (1995 in Faris, 2012) writes '*what is taught in school is not based on or tied to the accumulated indigenous experience and wisdom of teaching of the ancestors. The community is ignored as though it has nothing to do with formation of African personhood or reality'* (1995:180 in Faris, 2012). Other African countries are challenged as well by developing education which includes the knowledge and values of Africa (Mueller and Bentley, 2009; Felix, 2012). Interesting that Ethiopia is challenged as well to develop education that reflects their culture because the country does not have been colonised in contrast to all other African countries (Faris, 2012).

Felix (2012) argues that western education, brought to Africa through colonisation and by missionaries, has failed to integrate African cultural values into its curricula; there is an urgent need now to re-evaluate the curricula offered in schools in Africa, especially in Nigeria. The result of this education according to Felix (2012) is the total loss of the African pride, the submergence of the African language, the breakdown of moral and social discipline, the dethronement of communalism and the shift from honour to materialism (Felix, 2012). Felix (2012) recommends to integrate the following subjects into the curriculum to teach African culture and values: small scale farming in the form of school gardens; home economics; greetings and respect for elders; encourage African dressing patterns; mid-day meals which serve African dishes and local dances, games, songs, warfare, art craft (Felix, 2012).

In Ghana, the British colonial influences laid to a disconnection between science education and the students' lives; which resulted in a few students choosing a career in sciences (Mueller and Bentley, 2009). Currently they develop an environmental and science curriculum based on aboriginal knowledge (Mueller and Bentley, 2009). It is important for Ghana to focus on good science education; at the moment they depend on experts from other countries to investigate local environmental problems so Ghanaian citizens may not be participating as fully in ecological decisions that sustain natural resources for the future (Mueller and Bentley, 2009).

2.4.2 Stats and Trends about Education

Primary education in Ethiopia is from 7-14 years and covers grades one till eight (Woodhead, Ames, Vennam, Abebe and Streuli, 2009). Since 1994 primary education is free in Ethiopia and the country tries to enrol all children into education. Enrolment increased tremendously due to new policies (Woodhead *et. al.*, 2009). In 2010 the Net Enrolment Ratio increased till 81 per cent which is a very high percentage compared to the enrolment of 36 per cent in 1999.

Table 1: GER² and NER for Primary Schools at National Levels 1999 and 2010:

	GER 1999	NER 1999	GER 2010	NER 2010
Ethiopia	50%	36%	102 %	81%

Source: EFA GMR (2012)

The Ethiopian government tries to increase access to primary education and to, improve the quality of education and address equity issues between boys and girls, between regions, and between rural and urban areas (Woodhead *et. al.*, 2009). Ethiopia was identified in the EFA Global Monitoring Report 2008 as among the countries that are making the most rapid progress towards the Dakar goals of universal enrolment and gender parity at the primary level (Woodhead *et. al.*, 2009).

A broader-based indicator of progress is provided by the EFA Development Index (EDI), which incorporates net enrolment ratio in primary education (as above) and includes three additional indicators: adult literacy, gender and education quality. In this regard, progress was substantial and the EDI increased by more than 10 per cent between 1999 and 2006. However, despite these efforts, Ethiopia's EDI is still low, ranking 125 out of 129 countries (UNESCO 2008).

²The GER is the number of students enrolled in primary school, regardless of age, expressed as percentage of the population in relevant official age group. It is generally used to show the general level of participation in a given level of education. The fact that gross enrolment rates are above 100 per cent indicates that there are over-age students in primary schools (Lopez and Maoulidi, 2009).

Despite these achievements, many reforms are needed before quality education can be assured for all children (Woodhead *et. al.*, 2009). At the moment many classes are overcrowded; there are severe shortages of facilities, books and qualified teachers. Between 1999 and 2005 the pupil-to-teacher ratio in primary education increased by more than 12 per cent (from 1:64 to 1:72 students). This calculation, however, is based on official enrolment figures, and the numbers of children attending class on any one day is often much lower, although when teachers are absent it can be much higher (UNESCO 2007). The literacy rate of youth (15-24) in Ethiopia is 55 per cent (EFA GMR, 2012) and 47 per cent of the children completes primary education (EFA GMR, 2012). The increased enrolment (as showed in table 1) is not any guarantee of educational achievement. Research shows that while only 6 per cent of 12-year-olds were missing from the school roll, 39 per cent were unable to read a simple sentence (e.g. 'The sun is hot') in the language used at school (Woodhead *et. al.*, 2009).

The next section is on nutrition curricula in Africa. How and what are children currently taught about food is the central question.

2.5 Nutrition Curricula in Africa

2.5.1 Aim of Nutrition Education

Within the broad debate on best education practices, nutrition education encompasses different approaches. Lytle (1995) wrote a theoretical analysis in 1995 in which she describes two different approaches towards nutrition education, and which is still relevant today. The goal of the first approach is to gain knowledge, build skills and shape attitudes. Nutrition education is seen as part of the general curriculum and is designed to produce nutritionally literate consumers. Children have to be able to understand food and nutrition issues so they can select a balanced and healthy diet (Lytle, 1995). The second approach focuses on behavioural change, for example a programme with the goal of reducing children's consumption of sugar and salt (Lytle, 1995).

Perez-Rodrigo and Aranceta (2001) describe the main attributes that good school-based nutrition education should contain: (a) address the needs and interests of

students, teachers and the school; (b) be relevant to programme goals; (c) take into account what children already know and can do; (d) be culturally appropriate; and (e) be delivered in a way children can understand and teach the skills and knowledge required to improve or strengthen healthy eating habits (Perez-Rodrigo and Aranceta, 2001). The programme should not only focus on nutrition information but also on the development of skills related to food, such as cooking, food preservation, social and cultural aspects of food and eating, consumer aspects and positive body image; all these areas contribute to healthier food choices (Perez-Rodrigo and Aranceta, 2001). Research has proved that a behaviorally focused approach with active methods, including food-based activities, will enhance the effectiveness of nutrition education programmes and, thus, the nutrition knowledge of children (Oldewage-Theron and Egal, 2012).

The school should also be aware of the ‘hidden curriculum’; in other words the indirect lessons (often unintentionally) taught by schools through their actions, assumptions and structures. For example, the message from food being served in school meals (Perez-Rodrigo and Aranceta, 2001). The message in the cantina should correspond with the nutrition curricula (Barlow and Stone, 2011).

Poor nutrition knowledge is one of the main factors in the development of malnutrition; therefore nutrition education and knowledge should receive high priority (Oldewage-Theron and Egal, 2012). Schools are in an excellent position to promote healthy eating, as children spend a lot of time at school (Oldewage-Theron and Egal, 2012). Children are effective change agents; transferring what they learn at school to the communities they live in (David, Kimiywe, Waudu & Orodho 2008 and Oldewage-Theron and Egal, 2012). Providing children with nutrition education in schools therefor is an effective investment (David *et. al.*, 2008). Children are naturally receptive to new information, therefore knowledge and skills learnt at a young age are more likely to be retained and practiced in future (David *et. al.*, 2008; Oldewage-Theron and Egal, 2009). An additional potential benefit of nutrition education is that by improving the health of schoolchildren, educational performance and learning may be enhanced (Steyn, Lambert, Parker, Mchiza and De Villiers, 2009).

Malnutrition and poor health are big challenges in Africa often caused by food shortages. However, this is not the only cause. Other factors such as ignorance, illiteracy and traditional attitudes also play important roles (David *et. al.*, 2008). Health, nutrition and education are closely linked; improving the health and nutritional status of school-age children and adolescents is an effective investment for the future generation (Delisle, Receveur, Agueh and Nishida, 2013). With nutrition education people get the knowledge, attitude and skills to develop good dietary habits. Such an approach is long-term focused and thus more sustainable than the provision of food aid (David *et. al.*, 2008). With knowledge, hunger is fought more effectively and sustainably, as people are empowered to produce their own food, instead of receiving food aid (David *et. al.*, 2008).

2.5.3 Examples of Research

This section describes seven studies done in Africa on nutrition curricula and the effectiveness. Different aspects have been studied. The first four examples- one done in Kenya (David, Kimiywe, Waudo and Orodho, 2008); in Zambia (Sherman and Muehlhoff, 2007); South-Africa (Oldewage-Theron and Egal, 2009) and Burkina Faso and Benin (Delisle *et. al.*, 2013) – studied the effects on children of classes about nutrition. The study done by Steyn *et. al.* (2009) in South-Africa provides an overview of best practices. Oldewage-Theron and Egal (2012) studied the effectiveness of more teacher training on the nutrition classes in South-Africa. The last example is a study done in Malawi on nutrition classes for farmers and the effects on child growth (Kerr, Berti and Shumba, 2010).

David *et. al.*, (2008) performed a nine-month nutrition intervention to address the gap in knowledge among school children in the Machakos District. The research was conducted in four schools, two schools that participated in the programme and two control schools, situated evenly within rural and urban areas. There was a significant improvement in nutrition knowledge and practice in both the rural and urban experimental schools following the curriculum intervention; knowledge was also shared with the community. A central finding was that, although food shortage may be the main reason for malnutrition, nutrition education does in fact tackle this

effectively. Nutrition education can be affordable and easily available through resources such as school gardens. An important policy recommendation is given - more effort should take place to improve nutrition education among school children in developing countries (David *et. al.*, 2008).

The research in Zambia focused on behavioural change based on evidence from the Zambia Nutrition Education Basic School (NEBS) project (Sherman and Muehlhoff, 2007). The children studied had deficits of several minerals and vitamins. For example many children suffered from a vitamin A deficit so the children were taught to add more groundnuts to their diet (Sherman and Muehlhoff, 2007). The research shows that the children changed their diet as much as possible to add more of the foods they were taught to eat. A concern raised by the children was that certain food products are simply not available to them (Sherman and Muehlhoff, 2007). This raises ethical issues concerning teaching children in developing countries about nutrition, because food for a healthy diet might not always be available or affordable to them.

Oldewage-Theron and Egal (2009) also emphasise the positive impact of nutrition education. They conducted research at schools with six and seven year old children from lower socio-economic groups in South-Africa (Oldewage-Theron and Egal, 2009), studying the impact of a nutrition education programme, and although children do not make their own food choices at that age, they did check their lunchboxes for healthier choices and showed active awareness by asking their parents for such (Oldewage-Theron and Egal, 2009).

The next example is of a study done in Burkina Faso and Benin (Delisle *et. al.*, 2013). The study is an evaluation of a pilot programme of the Nutrition-Friendly School Initiative (NFSI) launched by the World Health Organisation (WHO) in 2006. Pilot schools designed the programme according to the specific context and did not follow a pre-defined schedule of interventions. In both cities, NFSI showed promising results in terms of school and community mobilization towards improved nutrition and health. Household poverty and scarce school resources appear as major barriers to gaining full impact of NFSI (Delisle *et. al.*, 2013).

The study done by Steyn *et. al.* (2009) reviewed school interventions having a nutrition component in order to develop a best practice school intervention for the Western Cape Province, South Africa. The study showed that improving diet and physical activity by means of a teacher-based curriculum, a parental component and a healthy school environment conducive to healthy eating and increased physical activity (Steyn *et. al.*, 2009).

The main objective of the pilot study done by Oldewage-Theron and Egal (2012) was to determine the impact of a nutrition education training programme (NEP) on the nutrition knowledge of Life Orientation educators in public schools in SA. They studied if the quality of nutrition education could be improved by equipping the educators with more knowledge and awareness of the importance of nutrition education. The conclusion is that educators need more knowledge and that training is effective in providing them this knowledge. The recommendation is to provide educators with more training as well as teaching materials (Oldewage-Theron and Egal, 2012).

The last example of research about nutrition curricula did not take place in a school and was more focused on adults, but nevertheless it shows the positive impact of nutrition education and agricultural training (Kerr, Berti and Shumba, 2010). The study is an evaluation of a project in northern Malawi. Agricultural interventions involved intercropping legumes and the nutrition education involved home visits and group meetings. The effects on child growth and nutrition were compared between villages that participated in the project and villages that were not. The conclusion of the study was that long-term efforts to improve child nutrition through participatory agricultural interventions had a significant effect on child growth (Kerr, Berti and Shumba, 2010).

In Ethiopia nutrition curricula in primary schools are integrated in biology, life science or environmental science. In Chapter 4 this will be described in more detail.

2.6 School Feeding Schemes in Africa

2.6.1 The goal of school feeding programmes

School feeding programmes are well-recognised safety nets that alleviate hunger and support education, school attendance, nutrition, health and community development (Espejo, Burbano and Galliano, 2009). Having a decent meal at school should lead to higher enrolment rates, improved nutrition and better performance levels of pupils (Foeken, Owuor and Mwangi, 2007). Three objectives of school feeding programmes are to motivate parents to enrol their children in education and prevent absenteeism; to improve the nutritional status of school age children short-and long term and to improve cognitive functions and academic performance via reduced absenteeism and increased concentration (Walque and Alderman, and Kazianga, 2008; Bundy *et. al.*, 2009; Nkhoma, Duffy, Cory-Slechta, Davidson, McSorley, Strain and O'Brien, 2013).

There are at least 368 million pre-primary, primary and secondary-school children receiving food through schools around the world (WFP, 2013). The biggest programmes are in India (114 million), Brazil (47 million), the United States (45 million) and China (26 million) (WFP, 2013). The WFP (2013) estimates a global annual investment in school feeding between US\$47 billion and US\$75 billion – most of which is from government budgets (WFP, 2013). In lower- middle-income countries, 49 percent of primary-school children have access to school feeding, while in low-income countries, this figure is 18 per cent. In Ethiopia this percentage is even much lower with five per cent (WFP, 2013). Programmes in high- and middle-income countries are almost exclusively financed by internal revenues (taxes and other sources); programmes in low-income countries rely on donor support. In these countries, external sources of funding cover about 83 percent of programme needs (WFP, 2013).

School feeding can be defined as the provision of food to schoolchildren (WFP, 2013). School feeding programmes can be roughly divided in either an on-site meal during school hours or take-home rations (THR) that are usually provided once a month; mostly for girls or students with HIV (Kazianga, Walque and Alderman, 2008 and Alderman, Gelli, 2010; Gilligan and Lehrer, 2012; WFP, 2013). In-school feeding can, in turn, be divided into two common categories, either programmes that provide

meals or programmes that provide fortified biscuits or snacks (Gelli, 2010; WFP, 2013). Both types, in school feeding or THR, have advantages and disadvantages (Gelli, 2010). With the meals served at schools is made sure it reaches the children at school while food received by the household under THR is more likely to be shared by other household members, hence reaching (young) children who may be in need of additional food (Kazianga, Walque and Alderman, 2008; Gelli, 2010).

Critiques on school feeding

School feeding programmes are politically popular interventions but the effectiveness is hard to measure since their impact is partially on education and partially on school health (Gelli, 2010; Alderman and Bundy, 2011). Schools cannot always handle the extra enrolment caused by school feeding programmes which make school attractive (Kazianga, Walque and Alderman, 2008). The quality of education can go down because classrooms become overcrowded; the actual teaching time could go down if teachers administer the programmes; there are not enough school materials and the programme brings students to school of which the parents previously did not see the benefits of schooling, these students are expected to be less able to gain from schooling (Kazianga, Walque and Alderman, 2008).

The question is if you reach the most malnourished children if you target the children who are enrolled in school already. Several nutritionists have pointed out that nutrition is especially important during the first two years of life. Parents are also likely to enrol the healthiest and best fed of their children. The THR programme does address this critique and tries to make food available for siblings who are not enrolled in school (Kazianga, Walque and Alderman, 2008). School feeding programmes provide iron and other key micronutrients but not very effectively because are not targeted at the most vulnerable period in child development, which is between conception and two years of age (Alderman and Bundy, 2011).

Foods for Education projects are relatively expensive; they cost between \$28-\$63 USD per child per year (Bundy *et. al.*, 2009). This is a similar budget as that for full education in some developing countries. If raising school participation is the goal, programmes such a deworming, free school

uniforms, parent-teacher partnerships, and programmes improving teacher incentives may be more cost-effective (Alderman, Gilligan and Lehrer, 2012).

The World Food Programme (WFP)

The World Food Programme (WFP), a United Nations organisation, sponsors most feeding schemes in the developing world (Bundy *et. al.*, 2009). It has been operating for more than 50 years; providing meals in 26 million children in 60 countries with an investment of \$482 million dollars (www.wfp.org/school-meals visited on 9 September 2013; WFP, 2013). In 2009, WFP's role in school feeding changed in response to a broader organisational shift from food aid to food assistance (WFP, 2013). The WFP states always to look for sustainability and transition to national ownership at all stages of assistance (WFP, 2013).

There is a growing consensus that school feeding programmes need to become more economically sustainable and less dependent on foreign aid (Bundy *et. al.*, 2009). In order to achieve this, the Home-Grown School Feeding Programme (HGSF) has been developed by the WFP. This programme makes use of food produced and purchased locally (Espejo, Burbano and Galliano, 2009). Linking school feeding to local agricultural production is seen as a way to ensure sustainability and provide smallholder farmers with a stable market (WFP, 2013). Many countries are now exploring the possibilities of local purchase not only programmes related to the WFP (WFP, 2013). Using locally produced food for school feeding creates an opportunity to incorporate school gardens and teach children about nutrition, agriculture and the environment (Vandenbosch *et. al.*, 2009).

2.6.2 Examples of Research

This section describes six studies conducted in Africa about school feeding. The first study was done in Ghana and checked how many children depend on the school food (Essuman and Bosumtwi-Sam 2012). The design of the research in Uganda and Burkina Faso are similar. Both researches compare the effects of two different ways of school feeding: on site meals or take home ratios; in Burkina Faso (Kazianga, Walque and Alderman, 2008) and Uganda (Alderman, Gilligan and Lehrer, 2012), both in cooperation with the Worldbank. Also the research done by Nkhoma *et. al.*

(2013) in Malawi studies the effects of school feeding. The research done by Acham *et. al.* (2012) studies the effects of breakfast and mid-day meals in primary schools in Uganda, run with the hope to get more attention for school feeding from the government. The last example is also a study in Uganda which explores the different forms of school feeding organised by the parents or the school (Mulindwa, Bunjo, Kyaddondo and Misinde, 2013).

The first example is a research done in Ghana (Essuman and Bosumtwi-Sam 2012); which questions if school feeding is reaching the children that really need it. How many children do not receive enough food at home and depend on the school food? In three Ghanese schools; 20 children and 20 adults involved in school feeding and education where interviewed. The results of the study were that the dependency of the children on the programme varies a lot: some children do not eat the school food at all or only when they like it because they get enough meals at home while for other children the school lunch is the first meal of the day and the next meal will be supper. For some children the school food is a reason to come to school so the programme does increase enrolment (Essuman and Bosumtwi-Sam 2012).

The research in Burkina Faso provides new insights on how a range of educational outcomes including enrolment, absenteeism and academic performances respond to two different types of school feeding: on site meals and take home rations. Differently to most other research, they look at the effects on nutrition of school age children as well as younger ones. The findings are that both school meals and THR increase new enrolment for girls by about five to six percentage points. The scores of mathematics for girls increase a little but not significantly. Take home rations had positive spill overs onto younger children (Kazianga, Walque and Alderman, 2008).

The results of the research done in Uganda (Alderman, Gilligan and Lehrer, 2012) show positive impacts of the in-school meals programme on primary school enrolment when restricting the analysis to children who were not enrolled before the introduction of the FFE programmes. The studies compare the impacts of the World Food Programme's in-school feeding programme (SFP) with take-home rations (THR); which differ in the timing of meals and in the control over the food which could lead to differences in impacts. Both programmes impacted school attendance,

varying for grade and gender but they did not find significant differences of the effects of the on-site meals or take home ratios (Alderman, Gilligan and Lehrer, 2012).

What is interesting in relation to the school feeding programme in Tigray was the amount of food the programme included: the in-school meals programme provided a free fortified mid-morning snack that consisted of porridge made from micronutrient fortified corn-soya-blend (CSB), sugar, and water. The lunch consisted mainly of beans and either hot posh (maize meal) or rice, vegetable oil and salt. Together, the meals provide 1049 kcals of energy, 32.6 gm. of protein, and 24.9 gm. of fat. Households with children in the programme were required to contribute firewood for cooking and a fee of approximately US\$0.10 per month toward the pay of the cooks (Alderman, Gilligan and Lehrer, 2012). In Tigray the school feeding programme only serves micronutrient fortified corn-soya-blend which is served either as breakfast or lunch. Children have to bring twice a week firewood for the preparation (described in more detail in section 4.4 and 5.4).

The following research contributes to the debate if school feeding programmes are effective (Nkhoma *et. al.*, 2013). The study compared two rural Malawian public primary schools of which one has a school feeding programme and one does not. Children attending the school with school feeding received a daily ration of corn-soy blend porridge. The results are that the children from the school with the school feeding showed an improvement in reversal learning and catch-up growth in lean muscle mass. These findings suggest that the Malawian school feeding programme may have the potential to improve nutritional and cognitive indicators of the most disadvantaged children (Nkhoma *et. al.*, 2013).

This study studies the importance and effect of breakfast and mid-day meals (Acham, Kikafunda, Malde, Oldewage-Theron and Egal, 2012). The motivation of the study is the absence of school feeding in Uganda and the lack of interest for it from the authorities. They expect parents to provide meals even though many, especially in the rural areas, cannot afford to provide even the minimal daily bowl of maize porridge (Acham *et. al.*, 2012). Household questionnaires and school records were used to collect information on socio-demographic factors, feeding patterns and school

attendance. Academic achievement was assessed using unstandardized techniques, specifically designed for this study. The conclusion of the study is that underachievement was relatively high; inadequate patterns of meal consumption, particularly for the most poor, significantly higher scores among children from 'less poor' households and a significant association between academic achievement and breakfast and midday meal consumption (Acham *et. al.*, 2012).

The authors of this research (Mulindwa, Bunjo, Kyaddondo and Misinde, 2013) argue that the debate about school feeding should refocus. It is not the question is not whether parents should or should not pay for school feeding because all approaches involve a cost to parents; even the seemingly free models such as food packing have significant costs. The real question is what the most effective way is for parents to participate in supporting school feeding that, in turn, benefits the education of their children. The research was done in Uganda. For each system the report shows swot-analyses. The different systems described are: home-packed food, hot meals prepared by schools, food vending or school canteens; meals from the school garden and students returning home for lunch. School gardens are not sufficient to sustain school feeding programmes argue Mulindwa *et. al.*, (2013) and are meant to teach children on sustainable agricultural production. Gardens do not provide sufficient food for learner year-round. Overall the options observed had very limited coverage (Mulindwa *et. al.*, 2013).

None of the studies address the learning aspect for the students as part of the feeding scheme. For example good eating habits, the ingredients for a balanced diet or any other connection with the nutrition curricula of the school. In my research I explore the opportunity of integration of the feeding scheme, nutrition curricula and the school garden.

2.6.3 School feeding schemes in Ethiopia

In 2011 the WFP served meals in six regions in Ethiopia as part of the Food for Education (FFE) programme. 5 per cent of children enrolled in primary education where reached; this are approximately 681.000 children (WFP, 2013). The FFE is designed to increase enrolment and attendance and reduce dropouts in chronically

food insecure districts in rural Ethiopia (WFP, 2011). Poverty and food insecurity hinder efforts to improve the education sector in Ethiopia (WFP, 2009). Progress on enrolment has placed pressure on limited school infrastructure, threatening the quality of education (WFP, 2009). The investment in education has remained steadily low, at only US\$4.15 per student per year (WFP, 2009).

The annual WFP budget is 8.6 million US dollars; the government contributes 4.5 million US dollars and the community 621.000 US dollars (WFP, 2011). The annual cost per child for school feeding in Ethiopia is \$67 (WFP, 2013). The WFP works together with several local partners. Communities contribute by building the canteens and storage rooms, and the Ministry of Education devotes staff time to the programme. Parents contribute with firewood needed for cooking and a small financial remuneration for the cooks. Local authorities are also involved by building infrastructure and supplying raw material (WFP, 2009).

Lately the WFP started a new project: Purchase for Progress programme (P4P) which procured locally grown food from small holder farms (WFP, 2013b). This pilot programme is currently being used for WFP school meals in 37 pilot schools in Ethiopia's Southern Nations, Nationalities and Peoples Region (SNNPR) (WFP, 2013b). WFP hopes to scale up this programme. P4P particularly supports smallholders, who typically tend to less than two hectares of land and make up 70 per cent of Ethiopia's labour force (WFP, 2013b). The WFP has the biggest feeding scheme in Ethiopia; besides the WFP there are other, smaller feeding schemes financed by NGOs and the community.

2.7 Education for Sustainability

2.7.1 Education for Sustainable Development and food

'As educators we have the opportunity to nurture a child's curiosity and desire to explore the world. We also have the responsibility to prepare the child for the world of tomorrow. Although we can't see that world, we can help students ask relevant questions; develop processes for thinking and searching for answers; and communicate, work, and live cooperatively' (Barlow, 2007:5).

With the increasing interest in sustainable development the need for Education for Sustainable Education (ESD) grows (UNESCO, 2005; Capra, 2009; Barlow and Stone, 2011; Brown and Williams, 2011; Widhalm; 2011; Locke and Russo, 2013). Redesigning education for the purpose of creating ecological sustainable communities is one of the most critical needs of today's society at both global and local levels (Locke and Russo, 2013). ESD characteristics are based on the principles and values that underlie sustainable development with attention for the environment, society and economy (UNESCO, 2005). The vision of ESD on education is to balance human and economic well-being with cultural traditions and respect for the earth's resources (Segovia, 2010). ESD promotes life-long learning; is locally relevant and culturally appropriate; it is based on local needs, perceptions and conditions, but acknowledges that fulfilling local needs often has international effects and consequences; and is interdisciplinary (UNESCO, 2005). From 2005 till 2014 it is the United Nations Decade of Education for Sustainable Development (DESD) (UNESCO, 2005).

In this increasingly complex world it is important to learn to think in relationships and networks (Capra, 2009). Modern education started from Newton's reductionist theory; it dichotomises the different subjects and does not focus enough on the relations between the different subjects (Capra, 2009). An integrated curriculum helps teach content in a way that is more realistic and relevant to students' everyday lives than a subject-by-subject approach (Center for Ecoliteracy, 2010). As places of learning, schools have a special role to play; they can help students to understand our impacts on the planet; and become places where sustainable living and working is demonstrated to young people and the community (Ozsoy, 2012). ESD should teach interconnectedness of all beings (Widhalm, 2011).

Brown and Williams argue that many examples of ESD are caught in a modern web of theoretical, ontological, and epistemological assumptions that are incongruent with sustainability (Brown and Williams, 2011). Instead ESD should involve learning with the heart, senses, mind feelings and teach ecoliteracy (Capra, 2009; Barlow and Stone, 2011; Brown and Williams, 2011; Widhalm; 2011; Barnes, 2013). Widhalm gives the example of academic teaching, workshops, and conferences for sustainability and transformative change, in which she participated and frequently experienced

inconsistencies between learning content, structure, process, and environment. *'If the medium does not mirror the message, learning falls short of its potential'* (Widhalm, 2011:3). There is a disconnection if the learning modality embodies a traditional hierarchical structure (lecture, conference presentation, panel with questions and answer) while the content explores decentralised, pluralistic, highly interdependent dynamics (Widhalm, 2011).

Several authors point out that ESD should teach children to ask (Marshall, 2010; Williams and Brown, 2011; Widhalm, 2011; McBride *et. al.*, 2013; Francis-Morgan, 2013) Why do children enter school as a question mark and leave as a period? When they question, students are thinking, seeking meaning, and connecting new ideas to familiar concepts (Williams and Brown, 2011). Sustainability education is about dealing with uncertainty (Williams and Brown, 2011). As the famous pedagogic Dewey (1938 in Francis-Morgan, 2013) pointed out; truly educative experience must “arouse curiosity” and “strengthen initiative” (Francis-Morgan, 2013).

African countries also take part in the Decade of Education for Sustainable. They came together to design the framework for ESD in Africa in which socio-cultural, economic and ecological aspects are balanced (Manteaw, 2012). Manteaw concludes that besides the framework there is not much progress of ESD in Africa (Manteaw, 2012). Trudell (2009) advocates for education in local languages to increase literacy, which is important for sustainable development. Trudell gives several examples of how the option for education in the local language gives the weakest in society opportunities of development; thereby contributing to equity and social sustainable development (Trudell, 2009).

2.7.2 Examples of research

Several studies review sustainable learning programmes (Barlow and Stone, 2007; Williams and Brown, 2011; Ozsoy, 2012; Locke and Russo, 2013). Williams and Brown (2011) propose a framework for ESD that links sustainability pedagogy with pedology (the study of soil). Five principles that guide this relationship are presented: valuing biocultural diversity, sensitizing our senses, recognizing place, cultivating interconnection, and embracing practical experience. The teaching methods are

learning gardens where the children experience nature and soil (Williams and Brown, 2011).

Locke and Russo (2013) studied an eco-literacy programme offered by EARTH University in Costa Rica to rural community public schools. They found that environmental education and eco-literacy as tools of education for sustainable development have been successful but this is apparently due to historical reasons as well as programme design and implementation (Locke and Russo, 2013).

Ozsoy (2012) studied the effect on environmental knowledge of children enrolled in 'eco-schools' (<http://www.eco-schools.org.uk>) in Turkey. For this quantitative research children in the eco-schools as well as a control group who was enrolled in a regular school were surveyed. The results presented that the eco-school applications improve elementary school students' environmental knowledge, attitudes, uses and concerns (Ozsoy, 2012).

The Center for Ecoliteracy is dedicated to education for sustainable living and is based in California (Capra, 2009). 'Smart by Nature' is a framework for schooling sustainability developed by the Center for Ecoliteracy (Barlow and Stone, 2011). The four principles of the Smart by Nature framework are nature is our teacher; sustainability is a community practice; the real world is the optimal learning environment and sustainable living is rooted in a deep knowledge of place (Barlow and Stone, 2011). The experience of the Ecoliteracy Centre in California, which created holistic curricula around place-based projects, is that learning often increased and improved when learning was integrated with hands-on natural-world projects such as watershed restoration and school gardens (Barlow and Stone, 2011).

Barlow and Stone discuss the opportunity for teaching sustainable development by using the complexity of the food web as a starting point (Barlow and Stone, 2011). The systems around food are multifaceted; surrounding this merchandise of which there is no more basic human need, they are wrapped by economic, political and social systems. These are constantly influenced by larger trends such as globalisation, industrialisation, centralisation and more (Barlow and Stone, 2011). This complexity makes food systems difficult to redesign and transform, but also presents an outstanding focus opportunity for education to sustainability – using the centrality of food in children's lives (Barlow and Stone, 2011).

2.7.3 How does a child learn

‘Children show a natural curiosity about the world, but this curiosity may be easily repressed if adults fail to nurture it’

(Tuan, 1978 in Desmond, Grieshop and Subramaniam, 2004:22).

The central questions of this section are how a child learns and what the goal of nutrition education is. Dillon (*et. al.*, 2003) argues in his article that often research on education focuses on teaching rather than learning, assuming that learning takes place automatically. This is just partly true and depends on the type of teaching and the context (Dillon *et. al.*, 2003). Vosniadou (2001) argues that learning is primarily a complex social and cognitive process in which knowledge is actively constructed on the basis of what is already understood and believed (Vosniadou, 2001). Since prior knowledge can sometimes be a barrier in this process (Robertson, 1994 in Dillon *et. al.*, 2003), it is important to identify what students already know about a subject.

Learning takes time and requires practice to start building expertise (Dillon *et. al.*, 2003). Children learn best when they are motivated and feel that the material is culturally relevant and that they can use it in ‘real life’ (Dillon *et. al.*, 2003). The learner has to have an active role where he or she is motivated to plan and reflect on their learning (Vosniadou, 2001). The material should be organised around general principles and explanations instead of the memorization of isolated facts and procedures (Dillon *et. al.*, 2003). Children will remember the content longer if it is relevant to their needs and experiences and if information matches the context to the content (Dillon *et. al.*, 2003). Despite this, Dillon claims that arguments for experiential learning and learning-by-doing are often more a belief, with little evidence that it works (Dillon *et. al.*, 2003).

Kolb (1984) defines learning as “*the process whereby knowledge is created through transformation of experience.*” The process of learning is made up of four basic steps: 1) concrete experience, 2) reflective observation, 3) abstract conceptualization, and 4) active experimentation (Kolb, 1984 in Snodgrass, 2012). There is no single order in which to complete the four processes. In order to complete all four steps, the student must undergo personal experience (Kolb, 1984 in Snodgrass, 2012).

2.7.4 Garden Based Learning

'First the education of the senses, then the education of the intellect'
(Montessori in Desmond, Grieshop and Subramaniam, 2004:35)

"I hear and I forget, I see and I remember, I do and I understand."
(Confucius, 551 BC to 479 BC)

The positive impact of school gardens on the curriculum has been shown by educational research for several decades (Dillon *et. al.*, 2003; Pretty, Angus, Bain, Barton, Gladwell, Hine, Pilgrim, Sandercock and Sellens, 2009; FAO, 2010; Snodgrass, 2012; Msila, 2013). Participating in physical activity and experiencing nature both positively influence health and wellbeing (Pretty *et. al.*, 2009). The Food and Agricultural Organisation and UNICEF published a book in 1964 about school gardens in which they state that *'the garden constitutes one of the best laboratories for offering the child a series of experiences tending to create in him good agricultural and food habits which will lead to a better state of health'* (FAO and UNICEF, 1964:41 in Dillon *et. al.*, 2003:3).

A simple definition of Garden Based Learning (GBL) is *'an instructional strategy that utilises a garden as a teaching tool'* (Desmond, Grieshop and Subramaniam, 2004:20). GBL offers an effective strategy for education of sustainable development and ecoliteracy in any socio-economic setting (Desmond, Grieshop and Subramaniam, 2004). School gardens can be defined as cultivated areas around or near to schools, tended at least partly by learners, mainly producing vegetables and fruits and eventually small-scale animal husbandry (FAO, 2010). The purposes of a school garden vary; gaining prominence are the promotion of a good diet, nutrition education, and the development of livelihood skills. Traditionally, the focus laid on science education, agricultural training or generating school income (FAO, 2010). As environmental concerns broaden and diet-related health and nutrition problems increase, governments and development partners are increasingly interested in the potential of school gardens (FAO, 2010).

The purpose of school gardens used to differ between developed and developing countries but because of increasing needs for global food security, environmental

protection and better nutrition the differences are becoming smaller (FAO, 2010). In developed countries the focus lies on GBL: using gardens as laboratories for hands-on learning of science, environmental studies, and other subjects such as art and language. In developing countries educational use has been mainly for vocational agricultural training and food production for consumption, cash and school meals (FAO, 2010).

School gardens are not always perceived well in Africa, sceptics point to past failures, noting that school gardens were often poorly managed, giving rather negative examples to communities. It has also been argued that school curricula in Africa are dominated by competitive academic subjects and prioritise terminal examinations over practical skills and contextualised learning (Okiror, Matsiko and Oonyu, 2011). Many school garden projects face this challenge of not being a priority, as they are usually partly extra-curricular (FAO, 2010).

In the garden, children learn the basic concepts of ecological literacy in practice such as interdependence, diversity, cycles, scale and limits, energy and resources and sustainability (Barlow, 2007; Barlow and Stone, 2011). The garden provides the opportunity to expose children to fresh produce; teach them where their food comes from and food they might not be familiar with; because they grew it themselves they will be more likely to want to try it (Barlow, 2007; Barlow and Stone, 2011). *'GBL has the potential not only to contribute to the academic skills, but also to address a child's development in a social, moral and practical or life skills sense'* (Desmond, Grieshop and Subramaniam, 2004:23).

"When he [student] knows that the life of the plants that have been sown depends upon his care in watering them ... without which the little plant dries up, ... the child becomes vigilant, as one who is beginning to feel a mission in life."

(Montessori in Desmond, Grieshop and Subramaniam, 2004:27)

Gardening and cooking are examples of cyclical work—after cooking a meal it will be eaten, after cleaning up it will get dirty again. Planting will be followed with harvest and with planting again (Capra in Barlow, 2007). Another type of cycle we encounter in the garden is the life cycle of an organism—the cycle of birth, growth,

maturation, decline, death, and new growth of the next generation (Capra in Barlow, 2007). Research suggests a strong synergy between gardening and nutrition education (FAO, 2010). Nutrition education which focuses only on knowledge seldom transfers to practice and the effects on dietary practices of the school garden are much bigger when it is backed by nutrition education (FAO, 2010). The benefits to education and learning are increased when the school garden programme is integrated in the curriculum (FAO, 2010).

This section on GBL shows that it utilises school gardens to convey knowledge and skills in many different areas. In this research the focus lays on food, and how gardens can feed and teach children about a healthy diet and respect for the source of our food.

2.7.5 Design of the school garden and meals

“If kids aren’t in a position to learn because they’re hungry, or they don’t get enough nutritious food at home, then schools that don’t make the nutrition/performance connection in the cafeteria end up undermining what they’re trying to do in the classroom.” (Briggs in Center for Ecoliteracy 2010:18)

The Center of Ecoliteracy wrote two practical guides on how to start a school garden and how to design sustainable school meals (Center for Ecoliteracy, 2010 and Barlow, 2007). The focus lies on developed countries, as the centre is based in California, but in my opinion most advice and questions they raise are universal and also applicable for Ethiopia.

There should be consistency between what children are taught about health in the classroom and the messages and choices available to them in the lunchroom (Center for Ecoliteracy, 2010). School meals should not only provide the students with a full stomach but also deepen the knowledge about our food, where it comes from, our health, and the environment. Students are more likely to make wise food choices that affect their personal health and environmental well-being if they have the knowledge, which is the responsibility of the schools and will increase the well-being of society (Center for Ecoliteracy, 2010).

‘The nutrition curriculum should be connected to the health of the students and school meals should be part of the nutrition education programme’ (Center for Ecoliteracy, 2010:24).

The lunchroom provides the opportunity to teach the students about nutrition and sustainability if they see nutritious food being served and waste being recycled. The school should evaluate the message they send out during school meals and this should be in line with what they learn in the classroom. The school should purchase local food which is produced sustainably and think about their waste management to reduce and recycle waste (Center for Ecoliteracy, 2010).

To increase sustainability also means to think about social sustainability; for example increasing opportunities of the cooks. They find their jobs to be more rewarding when the work is less routine and allows them to make use of a larger set of physical and mental skills (Center for Ecoliteracy, 2010), as well as receive periodical training to develop professionally. The school should also evaluate the experience of the school meal; how is the atmosphere, the dining room, social interactions during meals and the eating environment as a whole (Center for Ecoliteracy, 2010). Students will be more likely to participate in the school meals if they can influence the menu. If some students get a special meal or eat for free, their privacy should be considered (Center for Ecoliteracy, 2010). If a school garden is available it might be a supplemental source for some produce (Center for Ecoliteracy, 2010).

Planning the school garden

The Ecoliteracy Centre in California published also a guide on how to start a school garden. School gardens can be designed everywhere when using creativity; in different climates, rural or urban areas and in schools with big and small compounds. Often an enthusiastic principal is key to the development of the school garden (Barlow, 2007). Involvement of the students is very likely to increase the success of the garden:

The more students are involved in planning and building their outdoor classroom, the greater sense of ownership they will feel at Life Lab Science Programme we like to say that each school’s garden is “owned and operated by the students.” (Barlow, 2007:10).

When planning the garden a range of factors have to take into consideration: sunlight, many plants need a lot of sunlight and one has to think how much sun the garden receives throughout the year. Water is a very important component, there has to be thought about watering the garden. The accessibility of the garden should be considered as well; accessible for students and not too far from the classroom. How is the garden secured and do you make sure nobody enters the garden. The visibility of the garden, make sure people can see it because it adds to the beauty of the school compound (Barlow, 2007).

The advice of the guide is to be realistic and start small. Make places with different functions, like places in the shade for class discussion, writing and drawing. Places for planting for each classroom and areas for special projects and experiments and community growing areas. Further an area for the compost and storage for the tools. Also the summer holidays have to be planned and it is best to have a garden coordinator (Barlow, 2007).

Although these guides focus on schools in developed countries; they point out very clearly all the different aspects that have to be thought true while designing school meals or gardens. The subjects, although in a different form, are mostly the same for Ethiopia.

2.8 Projects that integrate the school garden, learning & feeding - Africa

'To forget how to dig the earth and to tend the soil is to forget ourselves'
(Mohandas Gandhi in Williams and Brown, 2011:2)

"Once you see the excitement of a young child harvesting a first carrot, you have to wonder how education ever moved so far from its roots." (Johnson in Barlow, 2007:27)

Several researches show or recommend the use of school gardens for nutrition education (Perez-Rodrigo and Aranceta, 2001; Dillon *et. al.*, 2003; Barlow, 2007; David *et. al.*, 2008; FAO, 2010). To support learning, parts of land in schools can be transformed into gardens to improve nutrition education (David *et. al.*, 2008). The research of Foeken, Owuor and Mwangi (2007) shows examples of school gardens used for school meals. However little research specifically focuses on the use of school gardens both for feeding schemes and education nutrition.

Especially in developing countries, children are likely to benefit from the produce of school gardens (Foeken, Owuor and Mwangi, 2007). Perez-Rodrigo and Aranceta (2001) point out that successful programmes not only teach in the classroom, but also include an environmental element influencing the quality of food provided by school meals. School meals should be part of the educational process, providing the opportunity to practice what children learn in class as well as at home (Perez-Rodrigo and Aranceta, 2001). Examples of school garden projects can be found in almost every African country (Desmond, Grieshop and Subramaniam, 2004; FAO, 2010). De FAO (2010) describes examples of projects in South Africa, Uganda and Ghana. In Niger's educational policy gardens are one of the main elements and in Sierra Leone up to 80 per cent of all schools have practical gardening classes (Desmond, Grieshop and Subramaniam, 2004).

However many projects lack evaluation of the long-term impact (FAO, 2010). There is no overview of existing school gardens in Africa available and questions are raised regarding whether a garden still exists and how productive it is (FAO, 2010). The successful projects often take a holistic approach, integrating gardening, nutrition, school food, education and environmental concerns; characterised by slow growth over a number of years, continuity of support, and gradually increasing involvement of the community. With organic approaches, inputs are low, except where irrigation infrastructure is called for. Schools opt in, inspired by other schools or motivated by small grants, choose their own pace and measure their own progress (FAO, 2010).

The next section describes several studies done on school garden projects in Africa (Foeken, Owuor and Mwangi, 2007; Bowker and Tearle, 2007; Mueller and Bentley, 2009; Okiror, Matsiko and Oonyu, 2011; Snodgrass, 2012 and Msila, 2013).

The first one, in Nakuru, Kenya, researched the effect of school garden for the feeding scheme (Foeken, Owuor and Mwangi, 2007 and Foeken, Owuor and Mwangi, 2010). Foeken, Owuor and Mwangi (2007) found that school farming is very common in Nakuru town. Almost every primary and secondary school was found to be engaging in some form of gardening - from tree and flower growing to nutritional plants. Over half of the schools practice crop cultivation and some schools keep and care for a limited variety of livestock. In general, this trend has become more evident across schools in the Nakuru area in recent years, with much of the activity starting after the year 2000. As the by-product of rising food prices amongst other factors, some schools in Kenya have started to combine school farming with their school feeding programme, i.e. using the food they produce to constitute part of the daily meal given to children. These initiatives, though widespread, remain mainly at the particular school level and only suitable for those schools with enough land to cultivate crops and keep animals. The research shows that school farming and school feeding are connected. Respondents described the positive effect of the school garden on the school's feeding programme and the economic benefit from money saved on food purchasing by the school (Foeken, Owuor and Mwangi, 2007 and Foeken, Owuor and Mwangi, 2010).

The second research has been done on Gardens for Life associate schools, a network of schools in India, England and Kenya which have school gardens. Gardens for Life assists the school with the setup of the garden (<http://www.edenproject.com/gardens-for-life/> visited on 5 December 2012). The study focussed on the perception and learning of children in the garden itself (Bowker and Tearle, 2007). The research approach is characterised by the use of concept maps to uncover the characteristically different ways in which children discerned school gardening and to help provide insight into their understanding of this activity. It is very interesting to observe the differences between the countries and how they reflect typical cultural differences. Kenyan children displayed a very practical approach. They seemed to understand and had experience with the whole process of growing crops, from seeds to food on a plate. They viewed the school garden mainly as a means of growing vegetables for their own consumption and as a means of income (Bowker and Tearle, 2007). The English children showed little horticultural knowledge; they emphasised the importance of aesthetics and diversity – paying attention to design elements,

flowering plants and wildlife to be found in the garden (Bowker and Tearle, 2007). Indian children were most successful in linking their container gardens to the curriculum, showing a wider world view of school gardening, and related caring for their garden to conservation issues of caring for the world (Bowker and Tearle, 2007).

Msila (2013) has done a case study at a primary school in the Eastern Cape, South Africa that initiated a garden project, Garden for All Project (GAP), for orphans in the school. The question asked was what skills can pupils develop from an environmental awareness garden project within the school? This qualitative research showed that the GAP project was successful in combating poverty and it enabled the school to reach out to the community as they collaborated on environmental education. The learners benefit from nutritious healthy meals made possible by the project, and they also learnt about other learning areas and the importance of the school's links with the community (Msila, 2013).

The Mueller and Bentley (2009) study is about a curriculum reform in environmental and science education now taking place in Ghana which focuses on the community and ecosystems as the context of education. In this curriculum Ghanaian intergenerational knowledge and skills concerning the natural systems are included, including those of preserving ceremonies, personal expectations, narratives, beliefs, and values. The authors compare this development with the United States and argue that curriculum development should be inspired by these types of examples from developing countries (Mueller and Bentley, 2009). The curriculum does not focus on school gardens but is interesting in this context because it shows an example of education using local knowledge and working together with the community. Many of the exercises are case studies performed in the field, researching the effect of environmental degradation.

The following example is a study, conducted in eight elementary schools in Uganda, sought to compare the learning achievement of pupils taught using supervised home-gardens and those taught using school gardens (Okiror, Matsiko and Oonyu, 2011). Both the school garden and the home garden have their advantages. The home gardening activities enable students to observe the full cycle of a crop's growth. This was unlike school gardening activities which were often interrupted by holidays.

Other gardening benefits reported included: opportunities for pupils to put into practice what the teachers taught them in class; pupils' vegetable produce used as food to households; and, cash income earned from the sale of the vegetables (Okiror, Matsiko and Oonyu, 2011). However, pupils with plots in the school gardens on average performed better than their counterparts with plots at home because teachers' time and support offered to the groups favoured the school gardening pupils. Furthermore, the sense of achievement and acknowledgement feedback was more evident at the school environment, which created commitment. The home gardens generally lacked the accompanying inputs; particularly the lack of pesticides as parents expected them to be supplied by the schools, which gave the seeds to the pupils in the first place (Okiror, Matsiko and Oonyu, 2011).

Snodgrass (2012) compared two primary schools in rural Uganda, one with a school garden and one without, to measure the effects of the school garden. She concluded that school garden programmes benefited children by providing food for a school lunch and plant materials for their home gardens. The students of the school with a garden performed better at science exams. The results of the improvement in academic achievement were expected because of benefits from increased retention, improved attitudes about agriculture, and engagement in the learning process. Her recommendations for future research are an in-depth assessment of the uses of a school garden in the teaching methods, integration in the curriculum, teacher training, and teacher preparation in rural Uganda (Snodgrass, 2012).

2.8.1 Projects that integrate garden activities, learning & feeding - Ethiopia

Desmond, Grieshop and Subramaniam (2004) conclude that the Selam Technical and Vocational Center (STVC) in Addis Ababa, Ethiopia has one of the best GBL programmes in the world. Elementary and high-school students are involved in on-site gardening. While goals are defined to be focused on food production, vocational training, and environmental education, staff also sees an increase in self-confidence and self-worth of students. Two restaurants, fully engaged by the students, make use of the produce of the garden. Students manage large parts of the garden which teach them to oversee the process of harvests and prepare the products for consumption in

the two restaurants open to the public on the school grounds. Students are thus involved in all aspects of the food cycle from production through consumption and on to recycling (Desmond, Grieshop and Subramaniam, 2004).

The World Food Programme (WFP), FAO and UNICEF together have school garden projects. The goals of these projects are income generation for the school and skills for the children to implement at home. There are also schools which implemented gardens on their own initiative and seek finance from NGOs, for example Worldvision. Chapter 4 and 5 give more insight on garden projects in Tigray, North Ethiopia.

2.9 Summary

This literature review has attempted to provide an overview about the current literature of the different aspects of the research question; with this background information the empirical part of the research can be placed into the framework of this literature, and other research done in the field.

The theoretical framework is approached from a systems thinking and complexity theory perspective. In this time of polycrisis children should be educated about the interconnectivity of different challenges the world is facing. The food system is a simple, obvious and ecologically sensible way to educate children about the web of life. Through gardening one learns at different levels about the cycles of life and the child's own part of this cycle through fulfilling the basic need for food. Gardening and the school meals connected to the classroom curriculum make for an integrative strategy that supports a different paradigm of living and learning for sustainable futures.

Food security is still a growing challenge in Africa, and Ethiopia in particular. Without enough food learning is difficult and brains are likely not to develop to their full potential.

Different examples of research about nutrition curricula were given, followed by the different aspects of feeding schemes in Africa. The chapter looked at what are the purposes, challenges and successes and what research has been done. An overview of school gardens in Africa and examples of projects which integrate these three areas further lays the grounds for this specific research.

Chapter 3 will outline the research design and methodologies of this research.

Chapter 3: Research design and methodology

3.1 Introduction

This research will be conducted from a system thinking perspective in which seeing life in relationships stands central in order to understand the complexities of this world (Capra, 1996 and 2009). The research design is qualitative in character. The methodologies used are a comprehensive literature review followed by empirical research. The empirical research comprises observations, interviews, and surveys with stakeholders around the schools, other schools in the area and at the two case-study schools themselves. The research gives an overview of the integration or possible integration of school gardens, feeding schemes and nutrition curricula in the Tigray region in Ethiopia, based on interviews with the principals of 14 schools and in-depth case-study research at two schools.

3.2 Research Design

3.2.1 Qualitative research with a case study

This study is based on qualitative research; an in-depth study of why and how nutrition curricula, feeding schemes and the school garden are or can be integrated, and how this takes place within schools in Tigray, Northern Ethiopia.

Qualitative research explores a real-world setting; it is research in which the researcher discovers how people cope and thrive in that setting—and captures the contextual richness of people's everyday lives (Yin, 2011). A qualitative researcher is one who tries to give an objective observation of reality without attempting to influence this (Regeer and Bunders, 2009).

Yin (2011) emphasises three important objectives when doing qualitative research. Firstly, it is important that the research should be transparent, which means that all data and documents used are described so other people can review them (Yin, 2011). All the sources of documents that have been used can be found in the bibliography

and the data from empirical research in the appendix. The second objective is ‘methodicness’ which means following some orderly set of research procedures and bringing a sense of completeness to a research effort (Yin, 2011). In order to achieve this I kept the scope of my research small and ordered and tried to interview every actor in the field. Nevertheless to achieving a sense of completeness is difficult during such limited study in such a broad field. The third objective is ‘adherence to evidence’ this means that the goal is to base conclusions on data that have been collected and analysed fairly (Yin, 2011). The analysis of data in qualitative research is a challenge: *‘the goal is to acknowledge that multiple interpretations may exist and to be sure that as much as possible is done to prevent a researcher from inadvertently imposing her or his own interpretation onto a participant’s interpretation’* (Yin, 2011:12). The analysis of this research has been done carefully and the researcher has tried to show the interpretation of the participants instead of the researcher herself.

The qualitative research starts with a clear research question and the assumption that this is the question which needs to be asked (Regeer and Bunders, 2009). However a question now commonly asked is if this is still the appropriate way of doing social science research within an increasingly complex world, especially when ‘real-life’ problems are being investigated (Regeer and Bunders, 2009).

The transdisciplinary (TD) approach works with real world problems and issues. The researcher sees him/herself as an actor who participates in the research (Regeer and Bunders, 2009). The TD-approach brings disciplines together and works together with all the different stakeholders in the field (Regeer and Bunders, 2009). This makes it a valuable approach as the issues of food systems and food security in Africa ask for a TD approach due to their complexities. Pure transdisciplinary research is far more time-consuming in nature and requires a longer period of involvement. For these reasons, it would be inappropriate as a sole methodology for this MPhil research (J. van Breda, personal meeting). Thus, this research will be qualitative inspired by the TD approach.

3.2.2 Case studies

The empirical data of this qualitative research will be collected by use of a case study. There is no formula to define the use of a case study method, but the method is relevant for questions which require an 'in-depth' description (Yin, 2009). In my opinion, the case study method will be relevant because I try to explain present circumstances and investigate 'how' and 'why' food education is designed which are the questions that are appropriate to ask within a case study (Yin, 2009).

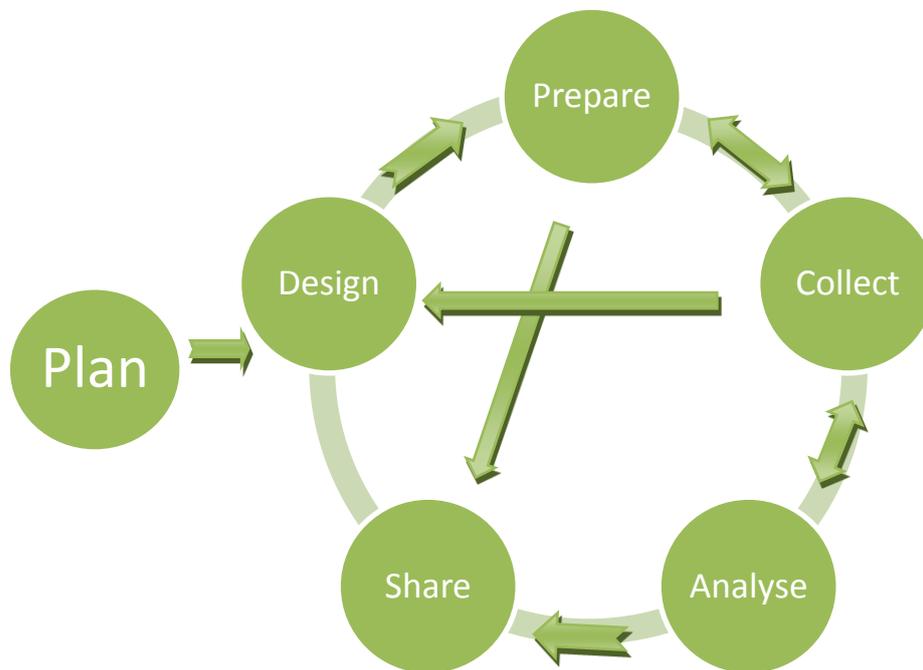
It appears that the food education and feeding schemes are complex phenomena which are embedded in a broader, even more complex global food system. The case study method gives the opportunity to investigate this real-life event in such a way that the holistic and meaningful characteristics will remain, such as individual life cycles, small group behaviour and organisational processes (Yin, 2009). The other parameter used to establish if the case study method is appropriate is if the investigator has little or no control over the experiment (Yin, 2009). This is appropriate for this study, as I will be observing and interviewing the participants, rather than conducting experiments in a laboratory setting with them (Yin, 2009).

One of the concerns about using a case study is that the investigator does not follow systematic procedures (Yin, 2009) so in this research I will pay extra attention to the systematic procedures used to collect and analyse data. Another drawback of case studies is that they cannot prove causal effects, because such generalization cannot be done in a limited scope. Yin argues that case studies can complement experiments by answering the 'why' and 'how' questions (Yin, 2009). This study aspires to have the same effect: to contribute to the debate about the 'why' and 'how' of the role of food in schools. The research will be partly a descriptive case study combined with an explanatory case study (Yin, 2009).

Case studies cannot be statistically generalised but can contribute to 'analytical generalization'. Understanding the distinction between these two types of generalization may be the most important challenge in conducting case studies (Yin, 2009). I do understand that this will be a challenge, but the fact that I am aware of the problem might change the limitation into an opportunity.

The selection of the case study is an important step; Yin (2009) explains that access to the potential data is the most important criterion for selection. Given appropriate access, a case which illuminates the research questions should be chosen (Yin, 2009). If such access is absent, Yin (2009) suggests that the research question be changed. The Bureau of Education in Tigray and the Pedagogic Institute of Mekele University helped by providing information for the selection of the school for the case-study.

Figure 4: The research process of a case-study (Yin, 2009):

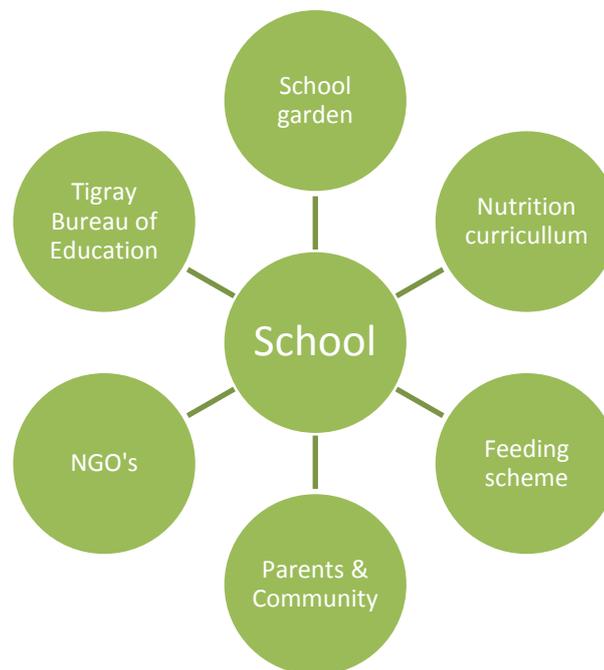


3.3 Data Collection procedures

The research starts with a comprehensive overview of the literature. The literature review will be followed by the empirical data-collection. The empirical data-collection contains structured and semi-structured interviews with the different stakeholders around the school, structured interviews with the principals of 12 other schools (14 schools visited including the two of the case study) in the region with a school garden and an in-depth research at two schools in the Tigray region in Ethiopia which have a school garden.

The research at these particular schools will comprise semi-structured and structured interviews with the principal and teachers involved with the garden, feeding scheme and nutrition curricula. Observations will be made of the garden, feeding scheme and nutrition curricula. The process will be documented carefully through the keeping of notes while doing fieldwork, as Mouton recommends for qualitative research (2001:104) and Regeer and Bunders for transdisciplinary research (2009).

Figure 5: Design of the empirical data-collection and actors involved:



3.3.1 Literature review

The researcher will start with a comprehensive literature review of research done in this field. This will help with the construction of the theoretical framework in which the empirical research will be done (Yin, 2009).

Bless (2000) describes seven purposes of the literature review which is in my opinion a valuable framework for the literature review. According to her the purpose of a literature review is firstly to sharpen and deepen the theoretical framework of the research, this I will address in the section about systems thinking and complexity theory. The second purpose is to get to know the latest developments in the area of

research as well as related areas. In order to give a good overview of the field I included the sections about food security and education in Ethiopia. The third purpose is to determine what has been studied and what still has to be studied. Especially in the sections about nutrition curricula, feeding schemes and examples of gardens for education and feeding I tried to give a full overview of research in the field in Africa and particular Ethiopia. The fourth purpose is to discover connections and contradictions between research and the fifth is to identify variables that have to be included. The sixth is to identify the definitions used in earlier work. I kept these purposes in mind while reading and analysing other studies. The last purpose is to learn from the different methodologies that have been used in earlier work; this was especially relevant for the research done in Tigray which consists mostly of smaller studies which made use of case studies (Bless, 2000).

The literature review contains literature in English; both from academic journals and grey literature. The following areas are covered; all focussed on Africa and particular Ethiopia and Tigray:

- Systems thinking and complexity theory
- Food security
- Education in Ethiopia
- Nutrition curricula
- Feeding schemes
- Sustainable education
- Garden-based learning
- Examples of gardens for education and feeding

The “search vocabulary” (Hart, 1998:32) included:

Table 2: Search Vocabulary

Subjects	Place	Verticals
Systems thinking	World-wide, Africa	Definition; philosophy; purpose; recent developments
Complexity theories	World-wide, Africa	Definition; philosophy; purpose; recent developments
Capability theories	World-wide, Africa	Definition; philosophy; purpose; recent developments
Global polycrisis	World-wide, Africa & Ethiopia	food security, peak oil, global food crisis
Ecoliteracy	World-wide, Africa & Ethiopia	Sustainable, effects, results, purpose, planning, scope, philosophy
Garden –based learning	World-wide, Africa, Ethiopia, Tigray	Effects, results, purpose, philosophy
Nutrition curricula	Africa, Ethiopia, Tigray	Sustainable, effects, results, purpose, planning, scope, philosophy, link with school feeding
Feeding schemes	Africa, Ethiopia, Tigray	Sustainable, effects, results, purpose, planning, scope, philosophy, educational effects
Examples of the integration of the school garden, feeding scheme and nutrition curricula	Africa, Ethiopia, Tigray	Sustainable, effects, results, purpose, planning, scope, philosophy
Food Security	Ethiopia, Tigray	Statistics, trends, research results and effects malnutrition on education
Education in Ethiopia	Ethiopia, Tigray	Purpose, statistics and trends

Variations which were tried for some of the key terms:

Garden-based learning = sustainable education = environmental education;

Impact = effects = effect;

Sustainable = sustainability

Feeding scheme = feeding programme = school food

Philosophy = vision

Results = success level

Ethiopia = Horn of Africa = East Africa

The focus is on literature from 2010-2013. Older research has been included if it was relevant in my opinion or if there were not enough sources available for this period.

Searching the Literature

Assistance was given by the sustainable development subject librarian at Stellenbosch University. The focus was on research done in Tigray for a full understanding of the region.

3.3.2 Interviews and Observations

The empirical data collection will contain structured and semi-structured interviews with the different stakeholders involved in education. Structured interviews will take place with the principals 14 schools in the Tigray region in Ethiopia which have a school garden in order to give an overview of the trends in the region. Observations and semi –structured and structured interviews will take place at the two schools, selected out of these 14 schools, for the in-depth case-study research.

- Interviews; both structured and semi-structured with the different actors around the school:
 - Department of Education
 - NGO's which are involved
 - World Food Programme (WFP)
- Structured interviews and observations at 14 schools in the Tigray region with a school garden:
 - Interview with the principal of the school about the school garden, feeding scheme and nutrition curricula; and
 - Observations of the school garden: what do they grow?
- Observations at the two schools for the in-depth case-study research:
 - The garden: What they grow, how do they use it, etc.?

- School meals: What they eat, where they eat, who cooks etc.? Classes about nutrition and food: what is taught, how and who teaches the classes?
- Interviews both structured and semi-structured at the school:
 - School principals
 - Employees responsible for the nutrition curricula
 - Employees responsible for the school garden and school meals
- Interviews both structured and semi-structured with the community of the school:
 - Community members
 - Parents
 - Employees of the *Tabia* (municipality of group of villages)
 - Woreda Bureau of Education

3.3 *Place of research*

3.4.1 Time Schedule

The empirical data collection took place from March till the end of May 2013 in Tigray in Northern Ethiopia. I was based in Mekele, the capital of the region and base for all regional government offices, as well as most NGOs operating in the area. From there I visited different schools with school gardens in the area.

During the first two weeks of April, 14 different schools were visited for a structured interview with the principal about the school garden, the feeding scheme and nutrition curricula. The school garden was observed as well. Of these two schools were selected for in-depth research at the school which took place over a period of six weeks (second half of April and May).

The selection of these two schools depended on quality of access, the existence of a school garden, whether the students work in the garden and if the garden is used for feeding scheme. These aspects influenced the selection of the two schools for the in-depth research.

3.4.2 Place of research

The empirical data collection took place in Tigray, North Ethiopia in the *Woredas*: Kilde Awalo, Wokro, Mekele and Hintalo Wajirat. 14 schools in these areas have been visited. The schools were selected because they have a school garden, nutrition curriculum and in many cases a feeding scheme. Most schools could be reached by public transportation; but in the case of two schools a car from Mekele University was used. The schools are in a two-hour range (based up on the use of public transportation) from Mekele.

3.3.3 Permission from the Bureau of Education, Tigray

The Bureau of Education of Tigray gave permission for the school visits; see Appendix A. I had permission to interview the principal, teachers, students and other actors. As can be seen in Appendix B I also received permission from Qihen Primary School and the Nicolas Memorial School, as well as the permission of the WFP to participate in this research.

3.5 Summary

This chapter gives an overview of the research design and methodologies of this research about the integration of school gardens, feeding schemes and nutrition curricula in Tigray, Northern Ethiopia. The theoretical framework is systems thinking and complexity theory. The qualitative research will make use of a case-study approach and in-depth research at two selected schools. The empirical data-collection includes structured and semi-structured interviews and observations.

The research took place in Tigray in the *Woredas* Kilde Awalo, Mekele, Wokro and Hintalo Wajirat from March till the end of May 2013. Permission to visit the schools was given by the Bureau of Education of Tigray.

In Chapter 4 the case study and the role of food in schools in Tigray, is described. Information from interviews with government officials and NGOs and research about food and food gardens in schools in Tigray is given.

Chapter 4: Case study – The role of Food in Schools in Tigray

4.1 Introduction

This chapter marks the start of the case-study and creates the framework around the two schools of the in-depth case study. There will be an attempt to give the context of the region – with emphasis on the status and view of food in Tigrinian schools. This will contribute to answer the research question: to what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

The data are mostly based on empirical data from interviews with the different actors involved in education in relation to food in Tigray; see table below.

Table 3: Interviews with NGOs and Tigray Bureau of Education:

Date	Organisation	Interview	Participant
8 and 14 March, 10 May	Tigray Bureau of Education	Interview with project coordinator school feeding	Mr Mohamed
1 April	Institute for Sustainable development	Meeting with Mekele coordinator	Mr Arefine
2 April and 13 May	WFP	Head of Mekele sub-regional office	Mr Mesfin
5 April 2013	Tigray Bureau of Education	Coordinator of environmental education	Mr Hadgu
17 April and 21 May	Bureau of Education Kilde Awalo	Principal of the bureau	Mr Kidan
24 April	UNICEF	Coordinator environmental education	Mrs Ginet
20 May	Tigray Bureau of Education	Curriculum and implementation performer	Mr Adane

16 May	Nicolas Memorial School	Environmental science teacher	Mr Gebrzigabiher
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See appendix C for detailed information about the schedule of the interviews.

The objective addressed in this chapter is:

- Investigate the status of school gardens, feeding scheme and nutrition curricula in schools in Tigray, Ethiopia through interviews with different actors and school visits;

The chapter starts with an overview of education and food security in Tigray. Section 4.2 is an overview of the current status regarding food security and the general diet of the community. As well as how education is organised, the policies regarding food and environmental education and an overview of the different actors involved; their responsibilities and influence.

Section 4.3 is about school gardens. The WFP and FAO have started several school gardens and the purpose of these will be discussed. There are also school gardens created as part of environmental protection education programme. In the last section examples of NGOs supporting school gardens are given. An overview of school feeding is given in the section 4.4. The World Food Programme (WFP) is the biggest provider of school meals in Tigray and works together with the Tigray Bureau of Education. A few schools initiated their own school feeding; examples of these are given as well.

Section 4.5 is about nutrition curricula. All schools in Tigray follow the same curricula in which students are taught about nutrition in environmental science, grades one - four and in biology in grade seven. The focus is on explaining different food types and how to eat a balanced diet. Other topics include hygiene, food production, sources and general knowledge about food. The environmental education and protection curriculum, which is not compulsory, also teaches about nutrition by promoting school gardens. In Section 4.6 the integration and the potential for integration of the school garden, nutrition curricula and the feeding scheme, is discussed. Paragraph 4.7 is a summary of this chapter.

4.2 The Tigray region in Ethiopia: Education and Food Security

4.2.1 Tigray

Tigray is the most northern regional state of Ethiopia; it borders with Eritrea and the language spoken is Tigrinya (Edwards, Egziabher and Araya, 2010). Ethiopia has nine regional states and two city administrations. The regions are divided into ‘*Woredas*’ which can be seen as districts. These *Woredas*, are divided in ‘*Tabias*’ in Tigray and ‘*Kebeles*’ in other regions and these consists of several villages. Villages are often not clearly bordered as they are scattered over the landscape (Edwards, Egziabher and Araya, 2010).

4.2.2 Education

In Tigray there are 2018 primary schools where 1012569 children go to school (Tigray Bureau of Education, 2013). There are 148 secondary schools in the region (Tigray Bureau of Education, 2013). The enrolment of boys and girls does not differ significantly; 511101 boys are enrolled and 501468 girls (Tigray Bureau of Education, 2013).

In 2007 the Gross Enrolment Ratio (GER) of Tigray was 104.05 per cent³ and the Net Enrolment Ratio (NET) 90.51 per cent. The enrolment in primary education in Tigray is above the national average; this is one of the reasons that the schoolfeeding scheme of the WFP decreases in Tigray and increases in other regions as enrolment is one of their main goals as will be explained later more in detail (A. Mesfin, 13 May 2013).

³The GER is the number of students enrolled in primary school, regardless of age, expressed as percentage of the population in relevant official age group. It is generally used to show the general level of participation in a given level of education. The fact that gross enrolment rates are above 100 per cent indicates that there are over-age students in primary schools (Lopez, Maoulidi and MCI, 2009).

Table 4: GER and NER for Primary Schools at Regional and National Levels 2007:

	GER 2007	NER 2007
Tigray	104.05%	90.51%
Ethiopia	100%	68%

Source: Tigray Region Education Bureau (2007); EFA GMR (2008)

Primary school in Ethiopia stretches from grade one till grade eight. Children are supposed to start grade one at the age of seven, but many children enrol school later. The main subjects of grade one till four are: Tigrinya, English, mathematics and environmental science. In grade five, Amharic (the national language of Ethiopia) and social sciences are added to the curriculum and environmental science is replaced by integrated science (grade five and six) and biology, physics and chemistry (grade seven and eight) (Lopez and Maoulidi, 2009).

In 1994 Ethiopia officially abolished school fees, but local education officials indicate that besides the formal tuition fee parents do have others costs towards uniforms, activity fees, transportation and school meals. Another financial aspect is that when a child attends school instead of working the family income decreases (Lopez and Maoulidi, 2009).

Primary education in Ethiopia is taught in the local regional language, i.e. Tigrinya in Tigray. Secondary and tertiary education is taught in English. The curriculum is prepared on a national level; the regional Bureau of Education translates the books and adjusts them to the social and cultural habits of the region (A. Adane, 20 May 2013).

Nutrition is taught as part of environmental science in grade one till four and in grade seven as part of biology. Nutrition education is not a part of the curriculum of integrated science in grade five and six or biology in grade eight. In section 4.5 below the content of these courses with regard to nutrition will be described.

All schools in Tigray have clubs for children after class; examples of clubs are: HIV-club, girls club, traffic-club, sport-club, environmental club etc. Differing per school,

most clubs meet 2/3 times a week for 1.5 hours. All schools in Tigray have environmental clubs supervised by the science teacher and lead by the students according to Mr Hadgu responsible for environmental education at the Tigray Bureau of Education (T. Hadgu, 5 April 2013). The environmental club usually works in the school garden, keeps the school compound clean, discusses environmental protection and sometimes the students participate in trips or guided activities like gardening training provided by the Bureau of Agriculture (T. Hadgu, 5 April 2013).

4.2.3 Food Security

The Tigray region is struggling with a serious problem of food insecurity, resulting from a combination of factors. The combined problems of environmental degradation, irregular rainfall, high population pressure, recurrent cycle of drought, lack of diversification in economic activities, and institutional factors threaten food security in the region (Van Der Viand Tagel, 2011; Edwards, Egziabher and Araya, 2010). The degraded environment contributes to low agricultural production which causes rural poverty (Edwards, Egziabher and Araya, 2010).

Tigray has a rugged terrain, ranging between 400 to almost 4000 m above sea level, covering a total area of 53,000 km². The region is structured into six administrative zones and 34 districts, and its population is estimated to be about 4.5 million of which 80 per cent live in rural areas. The annual growth rate is 2.5 per cent (Van Der Veen, and Tagel, 2011). Six per cent of the Ethiopian population resides in Tigray, in a relatively ethnically homogenous inhabitant composition (Saldanha *et. al.*, 2012). The climate is predominantly semi-arid with irregular rainfall and frequent drought periods. Average annual rainfall ranges between 500 and 900 mm and the rain falls between June and late August (Van Der Veen, and Tagel, 2011).

The last big famine was in 1985 (1977 Ethiopian time) in which many people died. The environmental teacher from the Nicolas Memorial School remembers for example that the people in Wokro, where he is from, had so little to eat that they ate a white mineral (culet) from the ground. It looks like milk and can be found in the ground (H. Gebrzigabiher, 16 May 2013).

Diet

The typical diet of the Tigray people consists mainly of *injera* with *shire*, bread and roasted barley. *Injera* is a large pancake made of *teff*, an indigenous grain and *shiro* is a sauce made from lentils. This diet contains mostly carbohydrates and vegetable proteins (H. Gebrzigabiher, 16 May 2013). People who are richer or live in urban areas are more likely to eat a more varied diet which contains more animal products; vegetables and fruits. In rural areas vegetables are consumed once a week on market-day and meat is mostly eaten on holidays due to habits, accessibility and economic reasons (H. Gebrzigabiher, 16 May 2013).

According to Ethiopian tradition, fruits are eaten when one is sick or after delivery of a baby. On a new born visit one usually brings fruits for the mother (H. Gebrzigabiher, 16 May 2013). The traditional context of fruit is that of recuperation. Very slowly it is getting more common to eat fruits as part of the regular diet – the integration of which is actively encouraged by the Health Bureau according to the curriculum developer of the Tigray Bureau of Education (A. Adane, 20 May 2013).

These days 65 per cent of the people try to introduce vegetables and fruits into their diet, on a weekly basis (H. Gebrzigabiher, 16 May 2013). The environmental science teacher of the Nicolas Memorial School recommends eating fruits and vegetables three times a week. People generally prefer meat although it is more expensive (H. Gebrzigabiher, 16 May 2013). Most people I interviewed were aware of the fact that people eat little vegetables and fruits (H. Gebrzigabiher and A. Adane, 20 May 2013).

‘The attitude of the people towards fruits and vegetables should change. They are not too expensive but the behaviour has to change. It is slowly changing and people do know the importance of fruits and vegetables now. They need role-models, for example, a teacher who eats oranges during the break’ (H. Gebrzigabiher, 16 May 2013).

The environmental science teacher of the Nicolas Memorial School described as an example his diet when he was a child in Wokro. As a child, the only vegetable he ate was a sort of cabbage and *beles* (cactus fruit) during rainy season. He drank milk every day because they had three cows. The family also had ten chickens but the eggs were sold. They only ate meat on holidays. He has now changed his diet and eats

more meat, fruit and vegetables such as mango, avocado, tomatoes, potatoes, carrot and cabbage. He learnt the importance of fruit and vegetables at school and he expresses the personal importance of keeping his body healthy. His family is also changing their diet due to his encouragement and campaigns by the government (H. Gebrzigabiher, 16 May 2013).

Mr Adane, curriculum developer, remembers that there was only one vegetable/fruit stand in the Mekele market when he was a child, while now there is a very big market section dedicated to vegetables and fruit, and all small grocery shops in Mekele sell tomatoes, onions and bananas. There is a cultural aspect to low fruit and vegetables consumption, and this takes time to change (A. Adane, 20 May 2013).

Dietary challenges in Ethiopia are that people eat too many carbohydrates because they are most readily available (H. Gebrzigabiher, 16 May 2013). Children in Tigray mainly consume *injera*, bread and *shiro* as their daily diet – an unbalanced nutritional composition. There are several activities to create awareness in the community about the definition and importance of a balanced diet through education laid by the Tigray Bureau of Health (A. Adane, 20 May 2013).

Photo1: Baking Bread



Photo2: Making Injera



4.2.4 Policies regarding to food in schools

The Ministry of Education of Ethiopia points out in the *National School Health and Nutrition Strategy* the importance of school feeding, gardens and nutrition curricula:

‘Nutrition education shall be integrated into the formal curriculum and the promotion of capacity building efforts through pre-service and in-service trainings. Schools shall promote good nutrition practices by integrating nutrition interventions including school feeding programmes and micronutrient supplementation into school activities thereby, reaching a high proportion of children and youth. Communities shall also be involved in planning, resource mobilization and management of school feeding programmes. Schools shall have gardens for demonstration purposes and to serve as resource centres for practical learning about nutrition’ (Ministry of Education Ethiopia, 2012:19).

The Ministry of Education is also aware of the current challenges: *‘From a policy and strategy perspective, there is lack of ownership and coordination as well as ineffective utilization of resources due to different standards being applied by different organisations on the delivery of comprehensive school health and nutrition (SHN) interventions’* (Ministry of Education Ethiopia, 2012:7).

Policy defines, up to federal level, that every school should be green, every student should grow plants and every school should have an environmental club in order to promote the minimization of climate change and deforestation, according to the head of the Bureau of Education in Kilte Awalo (Y. Kidan, 17 April 2013). Churches and monasteries are usually very green because they are protected, nurtured areas and the ambition is that schools reach a similar status.

The policy also requires that every school prepare holes for planting in June so the community can plant trees there in the summer, which is the rainy season. This is part of the federal policy of environmental protection and plantation (Y. Kidan, 17 April 2013). The growth plan of the country defines the school as the centre of the community. The head of the Bureau of Education of Kilte Awalo points out that change is happening; schools are greener and the knowledge of students is increasing (Y. Kidan, 17 April 2013).

4.2.5 The different stakeholders involved around food in schools in Tigray

Education is organised on a federal level but Ethiopia has made efforts to decentralize the management of schools by setting up Regional Education Bureaus. The purpose of this decentralisation is to empower local communities and to improve the quality of service delivery (Lopez and Maoulidi, 2009). The regions are divided in *Woredas*. Every Regional Bureau of Education leads the Bureaus of Education of each *Woreda* in the region (Y. Kidan, 17 April 2013).

Primary education is funded by different actors: the government, student and family contribution, income generation by the school itself, community contributions and other channels like NGOs and international institutions. Around 80 per cent of the budget is used for teachers' salaries and with the increasing enrolment of children this budget becomes increasingly tight (Lopez and Maoulidi, 2009).

Table 5: Levels of Authority for School Food Systems

Different Actors involved in Food in Schools in Tigray, Ethiopia & their responsibilities and influence

Government institutes	School-level
<p><u>Federal State/department of Education:</u></p> <ul style="list-style-type: none"> - Writes the syllabus for nutrition curriculum - Policies regarding to environmental protection and climate change - Relation with WFP <p><u>Tigray Bureau of Education :</u></p> <ul style="list-style-type: none"> - Translates and adjusts the nutrition curriculum for Tigray - Partner of the WFP for the selection of schools and distribution of the food regarding school feeding. - Partners with NGOs for special 	<p><u>School Principal:</u></p> <ul style="list-style-type: none"> - Often the initiator for a school garden together with his/her team. - Attract donors and contacts with NGOs with regard to projects to develop his/her school - Contact with the Woreda Bureau of Education about the budget for the school. - Communication with the community and the <i>Tabia</i> about enrolment and drop-out of the school. <p><u>Science teachers:</u></p>

<p>school programmes also in relation to school gardens.</p> <p><u>Woreda Bureau of Education:</u></p> <ul style="list-style-type: none"> - Distributes the school books - Partners with the Tigray Bureau of Education to select the schools for school feeding - Promotes school gardens amongst their schools <p><u>Woreda Bureau of Agriculture :</u></p> <ul style="list-style-type: none"> - Provides agricultural training for several schools with a garden. <p><u>Tabia:</u></p> <ul style="list-style-type: none"> - Works together with the school to increase enrolment 	<ul style="list-style-type: none"> - Teach the children about nutrition according to the curriculum - Sometimes teach extra-curricular subjects. <p><u>Leader environmental club:</u></p> <ul style="list-style-type: none"> - Leads the environmental club which often is responsible for the garden and the members of which work most in the garden.
<p>Donors/NGO</p>	<p>Community-level</p>
<p><u>WFP:</u></p> <ul style="list-style-type: none"> - Is the sponsor of the biggest school feeding programme in Tigray. In addition they assist several schools by the CHILD-programme which means that the school should be a centre of development for the community. <p><u>FAO:</u></p> <ul style="list-style-type: none"> - In three southern Woreda's of Tigray, the WFP and FAO started 13 school gardens about two years ago. They chose these places because there is believed to be water. The gardens are also equipped with drip-irrigation water systems. The 	<p><u>Community:</u></p> <ul style="list-style-type: none"> - Helps with the delivery and storage of the school food - Often plants trees and plants at the school garden in the summer <p><u>Parents:</u></p> <ul style="list-style-type: none"> - Are involved with the school like the community members are (often the community and the parents are the same people as most people have children) - Help financially by for example building a storage for the school food <p><u>Children:</u></p> <ul style="list-style-type: none"> - Often they bring water for the garden several times a week. - They refresh the plants in the garden

<p>woredas are Rural Alemata, Ray Azebo and Hintalo Wajerat.</p> <p><u>UNICEF:</u></p> <ul style="list-style-type: none"> - Provides information and instruction about nutrition and hygiene by means of different projects. - Wrote an environmental protection curriculum. <p><u>Institute of Sustainable Development (ISD):</u></p> <ul style="list-style-type: none"> - Provides training for teachers and farmers about composting, water preservations and more under delegation of the Tigray Bureau of Education. <p><u>USAID and Irish - Sweet potato project:</u></p> <p>Started a pilot programme at nine schools to introduce red-flesh potato to the area because of its nutritional value and suitability for school lunches.</p> <p><u>LG Korean – IT-company</u></p> <ul style="list-style-type: none"> - Sponsor of nine schools which have school gardens: They sponsor model schools with gardens financially and with IT -equipment. <p><u>Worldvision (Wokro) - NGO:</u></p> <ul style="list-style-type: none"> - Sponsored the irrigation system for the garden of a school in Wokro. Gives initial gardening training to schools. <p><u>Helvetas - NGO:</u></p> <ul style="list-style-type: none"> - One of their projects is in Qihen to promote cactus fruit and water management. They sponsored the 	<ul style="list-style-type: none"> - The idea of the garden is that the children learn the skills to make a garden at home. Many children do have a garden at home, especially in the rainy season. - The children learn about a balanced diet and hygiene and are supposed to implement this in practice.
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<p>school with a well and two water roof catchments.</p> <p><u>Imagine1day - NGO:</u></p> <ul style="list-style-type: none"> - Sponsored seedlings and roof water catchments in several schools. 	
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Source: Interviews with different stakeholders.

Inspired by: Michael K Stone/Center for Ecoliteracy, Smart by Nature: Schooling for Sustainability (Healdsburg, California: Watershed Media, 29:2009).

4.3 School gardens in the Tigray region in Ethiopia

There are several projects that promote and sponsor school gardens, with no one organisation or person on the regional level of Tigray who monitors which school has a school garden, for what purpose and how successful the garden is (own investigation). It is a fragmented field where several organisations and NGOs are involved. The Woreda Bureau of Education tends to know which school has a garden because they visit the schools more often (Y. Kidan, 17 April 2013).

Different actors claim credit for the school garden initiative. At a school level most say the school garden was the idea of the principal and his/her team. The WFP and Tigray Bureau of Education claim they initiated the gardens by sponsoring them and implementing policy.

In the following section the school gardens sponsored by the WFP, Tigray Bureau of Education and UNICEF are described, as well as the examples of other NGOs sponsoring parts of a garden. The results from the school visits are described in Chapter 5.

4.3.1 Gardens sponsored by the WFP and Tigray Bureau of Education

Mr. Mohamed responsible for the school feeding scheme at the Tigray Bureau of Education could not give a clear overview of the schools with a garden as they do not

monitor this separately. The Tigray Bureau of Education expects every school with the availability of water to develop a school garden (A. Mohamed, 14 March 2013). Gardening is part of the social science curriculum under ‘teaching about our surrounding’; according to Mr Mohamed every teacher should be able to teach about the garden (A. Mohamed, 14 March 2013). The children work in the garden to learn agricultural skills later to be used in the community. The food is sold as an income generation for the schools (A. Mohamed, 8 March 2013).

Gardens by the FAO

Two years ago, the WFP and FAO started 13 school gardens in three southern *Woredas* of Tigray. They choose these places because of the apparent availability of water. The gardens are also equipped with drip-irrigation water systems. The gardens are in the *Woredas*: Rural Alamata, Ray Azebo and Hintalo Wajerat (A. Mohamed, 14 March 2013). According to Mr Mesfin, head of the sub-regional WFP office in Mekele, the 13 schools that were started in cooperation with the FAO did not go far or were no longer monitored. These gardens were focused on fruits and vegetables; the main challenges of the garden were water distribution and the provision of seedlings (A. Mesfin, 2 April 2013).

Gardens as part of the CHILD-Schools

The CHILD (Children in Local Development) programme was started in 2006/7 by the WFP and the Tigray Bureau of Education; it is a special programme for extra development for 60 of the 146 schools which receive food from the WFP (A. Mohamed, 14 March 2013 and A. Mesfin, 2 April 2013). They would have liked to involve all the schools but that was not practically possible (A. Mesfin, 2 April 2013). The approach is to involve all the stakeholders to improve the quality of education and the school by, for example, building an extra classroom or latrines (A. Mesfin, 2 April 2013). These schools get extra funding to develop clubs about HIV and the environment and income generating activities such as a school garden (A. Mohamed, 14 March 2013). The WFP also purchases desks for these schools as some classes miss these completely – resulting in children sitting on the floor during class. These schools are supposed to be an example for the district (Mr Dawad; 14 March 2013). The school is seen as a centre for development and to serve as a model for the community (A. Mesfin, 2 April 2013).

The garden is part of income generation for the school and can serve for crop cultivation, animal fattening and dairy production or a mix of the three (A. Mesfin, WFP). The objectives for the gardens are to complement school feeding and to be an income generation levy for the schools. The schools themselves are often more interested in the income generation. (A. Mesfin, 2 April 2013). The produce of the garden will be sold for a reduced price to the students and the community (A. Mohamed, 14 March 2013). Water is clearly the biggest challenge for the gardens; the community is supposed to build the swales for the school (A. Mesfin, 2 April).

MERET and FFE Synergy

The MERET and FFE Synergy project is sponsored by FAO and LG Korean, started in 2009 and has been implemented in nine schools which are part of the 60 CHILD schools in five *Woredas* in Tigray. The school is seen as a centre for development, particularly in rural areas. In order to receive funding, the schools have to present a plan (A. Mesfin, 2 April).

These schools also implement school gardens where the children work and learn skills which can be used in the community. The harvest is sold at a low price to the children and sometimes weaker children have been selected to buy the products. The reason for selling is that the school wants the income but also because that there is not enough harvest to provide all the children with produce (A. Mesfin, 2 April).

The WFP provides training to development agents in the *Woredas* and school teachers intended to be active in the garden. The challenges of the gardens are water, inputs like seeds and seedlings and a lack of technical knowledge - especially when a teacher leaves and has to be replaced (A. Mesfin, 2 April 2013).

Gardens as part of the red flesh potato project

Five schools in Tigray participate in SIP – the Sweet potato project: an initiative to grow red fleshed sweet potato. This crop is important because of the high amount of vitamin A. Many people in Tigray have a vitamin A deficit which causes night blindness. This programme is financed by USAID and ‘Irish Potato’. It is a new crop for this area, so technical knowledge and management is required; Tigray is

traditionally only familiar with the white fleshed sweet potato (A. Mesfin, 2 April 2013).

Training has been given by the Tigray Research Institute to the school principal, school cooks and development agents. The farmers and schools work together. The concept is simple - farmers learn at school how to grow this crop so they will also start to grow it. The produce is already integrated into the school feeding, with 125 gram of sweet potato used to compliment a standard meal. Geographically, Ethiopia's lowlands are suitable for the sweet potato, while the high lands are more suitable for the Irish potato (A. Mesfin, 2 April 2013).

4.3.2 Gardens as part of the Environmental Education and Protection project.

The Environmental Education and Protection project is run by UNICEF and the Tigray Bureau of Education - teaching about advocacy, sanitation, planting and hygiene (Mrs Ginet, 24 April 2013). The project has been running now for three years; it started in eight *Woredas* which were selected because they are the most affected by climate change and deforestation. Now the project runs in 16 *Woredas*; in 88 schools in Tigray (T. Hadgu, 5 April 2013).

The focus of the projects is mainly on the school environmental clubs. School gardens are also promoted if water and land are available. If the school has a school feeding programme the harvest can be used as an addition to the school meal. In other cases, the quantities might not be enough to give out to the children so the garden is more a demonstration site for the students and the community (Mrs Ginet, 24 April 2013). With regard to trimestral supervision, UNICEF and Tigray Bureau of Education representatives check the planning of the curriculum, the organisation of the environmental clubs, the awareness for the environment, the biodiversity of the school compound and the use of indigenous plants (T. Hadgu, 5 April 2013).

The curriculum produced for this programme is called Environmental Education and Protection. It contains lessons about the air, water and land and how to protect the environment in order to follow a balanced diet (T. Hadgu, 5 April 2013).

The purposes of the school garden are: to prevent erosion; to provide shadow and oxygen for the students as they sometimes do group work in the shadow of the trees; school income generation from marketing of crops and fruits ; seedling distribution for the community and teaching the children about plants and a balanced diet (T. Hadgu, 5 April 2013).

Primarily indigenous trees and plants are planted in the garden. The students work in the garden under supervision of the biology teacher who is helped and trained by the local agriculture office. The Institute of Sustainable Development (ISD) gives training to the teachers, specifically promoting compost and gardening with natural techniques. Mr Hadgu agrees with this concept of sustainable farming but sometimes finds it conflicting with the policy of the government, which he is committed to, and which promotes chemical fertilizers. So the Bureau of Agriculture, which often works together with the Tigray Bureau of Education, promotes chemical fertilizers while the Institute of Sustainable Development focusses on natural ways of fertilizing the soil (T. Hadgu, 5 April 2013).

The crops and fruits are mostly for income generation for the school but sometimes they are consumed on site, especially during semester breaks. There are currently no problems with the availability of food in these regions (T. Hadgu, 5 April 2013). Some of these 88 schools are in the WFP school feeding programme and some in a programme by other NGOs. Some schools do not receive school feeding at all (T. Hadgu, 5 April 2013).

4.3.3 Assistance of NGOs to school gardens

Many schools start the school garden on their own initiative and contact NGOs for assistance to provide training, seedlings, roof water catchments and/or irrigation systems. For example, Worldvision in Wokro sponsored the irrigation system for the garden of a school in Wokro. Helvetas has a project in Qihen to promote cactus fruit and water-management. They sponsored the school with a well and 2 water roof catchments to assist them with the school garden. Imagine1day provided some schools with training, seedlings and roof water catchments.

The field is fragmented as quite a lot of organisations are involved. The WFP, UNICEF and the Tigray Bureau of Education often claim they initiated the school gardens of the different programmes, while upon visiting the schools they claim that they took the initiative and the sponsor only came on board later; according to my impression after interviewing different actors in the field.

4.4 School Feeding in Tigray

4.4.1 Introduction

The WFP, part of the United Nations, is worldwide the biggest organisation that provides school food; operating in more than 60 countries and providing meals for around 22 million children (www.wfp.org/school-meals visited on 9 September 2013). Also in Ethiopia and Tigray it is the biggest organisation that provides schools with food. The aim of the project is to increase enrolment and decrease drop-out from school. In Tigray the WFP operates only in rural areas, providing the schools with 'fafa' - a porridge made of soya/corn blend flour, oil and salt. The budget of the WFP for school feeding in Tigray is on the decline because school food is more needed in other areas of Ethiopia at the moment (A. Mesfin, 2 April 2013).

A few smaller projects also provide school food in Tigray and one school visited, the Nicolas Memorial School, does have its own school feeding programme. These examples from other initiatives are described in Section 4.4.3.

4.4.2 School feeding sponsored by the WFP and the Tigray Bureau of Education

The Tigray Bureau of Education and the WFP sponsor 146 schools out of a total of 2018 schools. In these schools 59499 males and 58541 females are enrolled (Tigray Bureau of Education, 2013). A total of 118040 children benefit from the WFP school feeding programme (Tigray Bureau of Education, 2013). All the schools are in rural areas and selected to be in areas suffering from droughts. The schools were selected on low enrolment and high food insecurity criteria. The number of schools supported

in Tigray goes down over the years because other regions of Ethiopia need the support more so the budget decreases in Tigray in order to increase in other areas for example Afar and Somali (A. Mesfin, 2 April 2013).

The purpose is to alleviate hunger, decrease the drop-out rate and increase enrolment. Numbers now show that the drop-out rate has decreased, and the benefit is spread across all children (A. Mohamed, 8 March 2013). Of the 88 school days in a semester, on average there is school feeding for 66 days, due to shortages of food supply. The meal is a porridge made from soya-corn blend flour, salt and oil which most schools serve before school starts. Every child gets 120 CSB; 6ml. oil and three gram salt per day (A. Mohamed, 14 March 2013).

The WFP delivers and funds the food while the Tigray Bureau of Education is responsible for the distribution of the food; they get funding from the WFP for this. The community and the school are responsible for unloading the trucks and the storage of the food (Mr Dawad, 14 March 2013).

The WFP: projects & trends

The WFP was set up to deal with food crisis but now it is diversifying itself. The objectives of the WFP are to deal with food crisis; to provide nutrition for malnourished children and pregnant or breastfeeding woman; building resilience to prevent a vicious circle and capacity building of the government (A. Mesfin, 2 April 2013).

The WFP has several programmes in Tigray:

- Relief, a programme that provides help during times of crisis, for example droughts;
- PSNP- productive safety net programme- to address chronic food security by providing credit and income generation, this is a development programme in which WFP provides the food;
- MERET, a development programme to save natural resources; active in 17 *woredas*;

- TSF- providing food for malnourished children and mothers; Screening is done by UNICEF and Bureau of Health. The urban HIV programme provides food or vouchers to get food;
- Food for refugees from Eritrea: the UNCHR and WFP work together in three camps;
- Food For Education (FFE) provides food for schools to encourage children to come to school, especially when it is far and in food insecure areas and provides the school with food (A. Mesfin, 2 April 2013).

Food For Education (FFE)

Food For Education (FFE) is the name of the school feeding programme of the WFP and works to encourage children to come to school, especially in food insecure areas where reaching school is not straightforward. The goals are to increase enrolment and attendance, especially for girls as their enrolment was traditionally lower. Improvement with regards to these targets is evident. Nutrition is not a major objective but indirectly is also achieved. Schools get soya-blend with vitamin enriched oil and salt (A. Mesfin, 2 April 2013).

The programme also has a positive effect on the nutrition; the WFP would like to research further their influence on nutrition. Other goals/influences they have are the improvement of the school environment, the CHILD-projects to improve educational quality, the garden to teach skills to the community via the child. Children are the best teachers for the community because they are well trusted and great ambassadors for new ideas in general. Mr Mesfin does not mention other outcomes/goals of the feeding scheme related to food, for example that children learn the importance of eating breakfast (A. Mesfin, 13 May 2013).

The biggest problem faced at the moment is the distribution of the food. The Tigray Bureau of Education is responsible for it and it has to go according to complicated government regulations. An example of such bureaucracy was when the Bureau organised the bidding but only one Transport Company was interested. According to the rules, three parties have to show interest; so the bidding was cancelled. According to Mr Mesfin everybody is afraid to sign or decide something in such a case. The food

should have been there by February/March. Mr Mesfin thinks they found a solution and the food will be delivered soon just before the school closes. The amount will be reduced and in the semester after the summer holidays they will provide the schools with extra food. Due to this reason the school in Daimaino, one of the schools I visited, does not have school feeding at the moment. (A. Mesfin, 13 May 2013)

The menu: *Fafa*

The FFE project provides the school with soya/corn blend flour, oil and salt. This menu has been decided together with the government. The meal does contain the micronutrient, vitamin A, in the enriched oil, and iodine in the iodine salt. Other micronutrients are not included. It does contain macronutrients that are required to be eaten in large quantities; corn provides carbohydrates and soya protein (A. Mesfin, 13 May 2013). ‘*Fafa*’ is an example of a balanced diet because the major nutrients, though partial - are there. Proteins, carbohydrates, fat, some vitamins, A and iodine (A. Mesfin, 13 May 2013). To add vegetables, fruits or animal proteins to the meal would be good, but practically not possible.

“It would be nice to have a very diverse diet, but it would be very difficult to realise this in practice” (A. Mesfin, 13 May 2013).

Mr Mesfin found it difficult to answer this question and went on the defensive. He said it would be difficult because of availability, accessibility, and difficulties with regard to cooking and storage. Milk would not be possible unless you have the powder, it would be also very expensive and difficult to get a big amount (A. Mesfin, 13 May 2013).

In the southern region there is a pilot programme with locally purchased food from cooperatives. There the food is more diverse and children do not have to adjust to it because it is local and thus familiar (A. Mesfin, 13 May 2013).

Ultimately the garden should complement the feeding scheme but at the moment schools use the garden for income generation. The harvest has not been enough for all the children, but sometimes the schools sell the harvest for a reduced price to the vulnerable children (A. Mesfin, 13 May 2013).

New directions of FFE

In Southern Ethiopia, a pilot programme was launched with Home Grown School Feeding which purchases the food for school feeding from local farmers. This was inspired by similar projects in Brazil (A. Mesfin, 2 April 2013). The Ministry of Education encourages the implementation of the Home Grown School Feeding (HGSE) programme to ensure sustainability and ownership of the school feeding programme (Ministry of Education Ethiopia, 2012).

In Tigray this does not happen yet and the food comes from overseas. (A. Mohamed, 14 March 2013). To purchase the food locally is not necessarily cheaper, but better for the local economy and will create better resilience in a case where donor money decreases further. The challenges of the programme in the South of Ethiopia at the moment are that the farmers often tamper with the price, are challenged to provide the food on time and the quality of produce is not always good. With increasing competition this might improve (A. Mesfin, 2 April 2013).

The intention is to implement this programme in Tigray as well. The sweet potato project is part of the Home Grown School Feeding project. The food in the south is purchased from cooperatives which grow it according to WFP requirements. In Tigray farmers are also organised in cooperatives. The production and organisation should be further improved in Tigray to make this programme possible (A. Mesfin, 2 April 2013).

Mr Mesfin hopes it will be organised in Tigray as well but there is no time frame for it yet. The pilot programme from the south has to be studied and adapted for use in the north according to the crop availability and climate restrictions in the north. The programme is a chance for local farmers to provide food to the schools at a lower price (A. Mesfin, 13 May 2013).

4.4.3 Other school feeding programmes

Other feeding programmes aside the WFP school feeding programme are small / local initiatives. The Salama Elementary School in Wokro organises bread and tea for

around 40 students (out of 2000) who attend the school financed by NGOs and the community, the. This is according to the principal (Mr Hailelassie, 11 March 2013).

The Nicolas Memorial School is a private school in Mekele which designed its own feeding scheme. Daily, all students are given either an egg, a cup of milk or a piece of fruit like a banana or orange. There are two reasons for this particular structure; firstly, the diet of most children is dominated by carbohydrates and vegetable proteins and secondly the school wishes to provide the risk that a full school meal provided will replace a meal they would otherwise get from their parents. The fruits, milk and eggs differ from their regular diet and will not replace a meal, but supplement their regular diet. The diet of carbohydrates and vegetable proteins is complimented with animal proteins and vitamins. The school is owned by the Tigray Veteran Association and sponsored by the Rainbow Foundation from England. Most parents are veterans (ex-soldiers) who fought in the war against the Derg, the Ethiopian communist regime that ruled from 1974 till they were over ruled and lost power in 1991. Some others fought in the Ethiopia – Eritrea war from 1998 till 2000. Many of the veterans are disabled and depend on state funding; some others are still able to work (Interview H. Gebrzigabiher, 2013). In chapter 5 this school will be described more in detail.

4.5 Nutrition Curricula in Tigray

4.5.1 Introduction

The school curriculum in Ethiopia is developed on a national level by the Department of Education. The Tigray Bureau of Education translates the curriculum into the regional language Tigrinya and adapts the examples for the region. All the schools in Tigray, including the private schools, have to follow this curriculum (A. Adane, 20 May 2013).

Within the curriculum of environmental science and biology, children learn about nutrition, food and food production. Integrated science does not contain subjects related to food, food production and nutrition. Environmental science is taught in grade one till 4, integrated science in grade five and six and biology in grade seven and 8.

According to Mr Adane, curriculum developer at the Tigray Bureau of Education, the focus lies on the explanation of the different food types: carbohydrates, fats, proteins, minerals and vitamins and how to eat a balanced diet. They also learn about food production and how to grow food.

The information of this section has been taken from the schoolbooks of each year (borrowed from the Tigray Bureau of Education (Tigrinya, read with help of translator)). Below is given an overview of the learning about nutrition within environmental science and biology; the other topics in these courses are not explained. The following table gives an overview of all the chapters of Environmental Science in Grade 1, 2, 3 and 4 and Biology in Grade 4.

Table 6: Overview of courses and grades which include learning about nutrition

Course	Grade	Units
Environmental science	1	1. We all people
		2. Family
		3. Our school
		4. The Tabia
	2	1 We
		2 Our community
		3 Our environment
		4 Tabia and Woreda
	3	1 Food and family
		2 Our environment
		3 Activity of the society
		4 Tigray
	4	1 Our body
		2 Our environment
		3 Our country
		4 Our social environment
Biology	7	1 Air
		2 Water
		3 Plants

		4 Animals
		5 Our body
		6 Land
		7 Biology, human beings and health

4.5.2 Environmental science

The following tables give a schematic overview of the subjects about food, nutrition and food production within the curriculum of environmental science.

Table 7: Environmental science grade 1

Course: environmental science	Unit	Topics	Content
Grade 1	1	Hygiene	Hand washing before and after eating, the bathroom, cooking and playing.
			Face washing before bed.
			Recommendation to wash the body every day.
		Food	Importance of food:
			To keep you healthy.
			To grow physically.
			For strength and energy.
		Examples of exercises	<ol style="list-style-type: none"> 1. What happens if we don't eat food? 2. What kind of food do you eat at home? 3. What are the sources of food in the community (garden shops, market etc.)? 4. The students have to give the taste of particular foods for example: Green pepper, lemon, salt and

			honey.
	2	Food	Foods common for their region.
			Seeding and harvest times of different crops.
		Social manners	To respect their parents, for example by serving them and also to stand up when the parents arrive home.
		Cooking	Information about cooking materials.
			Keeping kitchen materials clean.
			Avoiding flies in the kitchen.
		Exercises	<p>Examples of exercises:</p> <ol style="list-style-type: none"> 1. To say which food is common or uncommon (staple or not): banana, macaroni, <i>injera</i>, meat, lettuce, <i>inbasha</i> (big bread). 2. What are the seeding times and harvest times (more or less June and October Ethiopian calendar and last production in December) of the following cereals: corn, maize, peas, <i>teff</i> and sorghum? 3. Which of these cereals have to be grown or grow in the wild? (Most cereals have to be grown, not many grow in the wild). 4. The students have to say from different dishes of which cereal they have been made. For example thin bread, big bread etc.
	3		The students do not learn anything related to food, food production and nutrition.
	4	Purpose of water,	They learn about the purpose of water, air,

		air, plants and animals	<p>plants and animals and to respect all types of jobs.</p> <p>Air is for plants and animals to exist.</p> <p>Water is for drinking, growing plants and for the animals to drink.</p> <p>Sources of water are a spring, well, river and rain.</p> <p>Soil makes plants grow. Students learn about different soil types around their community.</p>
		<p>Relations of living things, animals and plants and the environment (humans are seen as thinking animals in Ethiopia)</p>	<p>The uses of plants are: source of food; decoration, building materials and a source of energy.</p> <p>To take care of plants: water them every day, weeding, add fertilizer, refresh them and by putting a fence to protect them from animals.</p> <p>Animals are living things. The students learn about the difference between domestic and wild animals.</p> <p>Benefits of animals are: a source of food, leather and for transportation of people and materials.</p>

Table 8: Environmental science grade 2

Course: environmental science	Unit	Topics	Content
Grade 2	1	Benefits of food	Food gives us energy, helps us to stay healthy and to grow. Animals and plants

			provide food.
		Sources of food	To learn about different food types and their sources. Eat enough carbohydrates and you will be happy, strong and energetic. If one does not eat this you will be vulnerable to sickness and unhappy.
			Foods which are a source of energy for study, playing and digging are for example: honey, egg, bread, bananas and sugar.
			The foods that keep us healthy are vegetables, cereals and fruits.
			Source of proteins are chicken, meat, milk, fish and eggs.
			Staple food is the food we eat most of the time; for example <i>injera</i> , big bread and roasted barley.
		Proper way of feeding	To wash hands before every meal.
			To sit properly.
			To eat slowly.
			Not to speak while eating.
			Before we swallow to chew properly.
			To let people serve first.
			To let others pick first.
		Not to eat too much.	
		Hygiene	To wash hands before and after a meal and the bathroom.
	2	Child rights	Child rights including the right to sufficient food.
		Time management	How to plan the day which should include time to eat breakfast, lunch and dinner.
		Community activities	To participate in community activities such as planting and cleaning.
		Energy	Our society needs energy: to cook, drive a

			car, enough energy inside the body. We can find energy from the food we eat; food makes us strong and active.
	3	Environment	The time, day and night and the seasons.
			Floods and droughts.
			The life cycle from birth till death of humans and plants.
			Sources of air- and water pollution.
			Deforestation; how to protect plants against erosion.
			The different parts of the plant.
	4		They do not learn anything related to food, food production and nutrition.

Table 9: Environmental science grade three

Course: environmental science	Unit	Topics	Content
Grade 3	1	Balanced diet	There are four different groups of food and a balanced diet means to eat a combination of these.
			To eat something daily from every group.
			Group 1: vegetables and fruits.
			Which fight diseases and keep us healthy.
			Group 2: cereals and lentils.
			Provide energy and energy to build up the body.
			Group 3: meat.
			To build our body and recover after sickness.
			Group 4: milk products.
		Food poisoning	Which help us grow.
		Food poisoning	Food poisoning is caused by cooked food which is kept for too long.
			After preparing food is stays open and attracts flies and rats.
			Ways to prevent food poisoning are:
			To keep the place where food is prepared clean.

			The person who prepares food has to be clean.
			Raw foods have to be washed.
			The kitchen has to be clean and contain no bacteria.
			The water used to cook has to be clean.
	2	Soil types and conservation	Types of soil are gravel, soft soil and fine gravel.
			The advantages of the different soils.
			How to conserve these.
		Benefits of water	Cooking.
			Drinking.
			Washing.
			Source of energy (hydropower).
			Irrigation.
			How to keep the water clean.
			To use it sparingly.
			How to collect rain water and use it for irrigation.
		Forests and energy	The uses of forests are for:
			Power.
			A source of food.
			Construction materials.
			The home for wild animals.
			How to prevent erosion.
			To make farming materials and furniture.
			How to prevent deforestation.
	3	Agriculture and farming	the benefits of good soil:
			It keeps plants on the ground.
			The minerals and water of plants passes through the soil.
		The use of compost	Important for the growth of plants.
			Mix soil with compost makes it easy to farm,
			for the roots to penetrate the earth,
			To store water, so rain can penetrate easily.
			Contains useful minerals for the plants.
		How to keep plants healthy	Preparations before farming and taking care of plants:
			1: prepare the piece of land.
			2: sowing.
			3: weeding and refreshing.

			4: to apply fertilizer (compost-traditionally).
			5: to protect plants from grasshoppers, birds and rats.
			The life cycle of animals for example flies and mosquitos.
			How to prevent them of growing.
			The life cycles of useful insects like the bee.
	4	Topography	
		Important Ethiopians from history	For example Dr Tewelde Birhan Gebre'egzabher, doctor in climate change and natural resources, who advised the country to only use compost for agriculture.

Table 10: Environmental science grade 4

Course: environ mental science	Unit	Topics	Content
Grade 4	1	Importance of food to our body.	Food gives us energy.
			Helps us to grow.
			Protect us from sickness.
		Balanced diet contains:	Carbohydrates.
			Proteins.
			Minerals.
			Fats.
			Vitamins.
			How to eat a balanced diet is a very important part of the nutrition education.
		Five food types & sources	1: Carbohydrates which are a source of energy. We should take it every day for our energy.
			Sources: honey, bread, potato, rice, wheat, pasta, banana and sugarcane.
			2: Proteins for body building and

			replacement of body cells.
			Sources: meat, egg, fish, milk, yoghurt, cheese, lentils and beans.
			3: Fats. The energy source of fats is bigger than the source of energy from carbohydrates.
			Sources: butter, fish or cow fat and peanuts.
			4: Minerals of which we only need a little amount; for example: calcium, iron, phosphorus, iodine, magnesium and zinc.
			Sources: milk and milk products, red meat, vegetables, liver, <i>red teff</i> (many types), cereals and salt.
			5: Vitamins which benefit us by keeping us healthy. The amount should be small; the consumption has to be little.
			Sources: milk, butter, <i>berbere</i> (red pepper), egg, papaya, tomato, lemon, orange, carrot and oil.
		Benefits of water for the body	Water is used by the body for the digestion system.
			Transportation of food in the stomach.
			Removing waste from your body through sweat and urine.
			To control body temperature and to circulate the blood.
			We can take the water directly or distract it from vegetables, fruits, tea, milk and soft drinks.
		Digestion system	Parts of our body digest and send the energy to different parts.
		Heart and blood	About the heart, the circulation of blood.

		Teenager	Physical and behavioural changes of a teenager (14-16 years old).
	2		In unit 2, unit 3 and unit 4 they do not learn about food, food production or nutrition.
	3		
	4		

4.5.3 Integrated Science and Biology

In integrated science in grade five and six the students do not learn about food, food production and nutrition. The table of content of both books is the same and is as followed: 1. Air, 2. Water, 3. Plants, 4. Animals, 5. Our body, 6. Land.

Table 11: Biology 7

Biology	Unit	Topic	Content
Grade 7	7: Biology, human beings and health	What is food	Food provides:
			Energy.
			Body heat.
			Keeps us healthy.
			Helps to build the body.
			Recover after one has been sick.
		Human food & the different food types	See table 12 below
		Consequences of not eating a balanced diet	Problems when feeding on one type of food.
			Examples of the sickness you get if you lack a food type.
			For example: if the food does not contain iron we get anaemia.
		Digestion system	The digestion system in detail.
		Blood circulation	The blood circulation.
		Balanced quantity	One should not eat too much.

Table 12: Human food & the different food types

A balanced diet does not mean you take from every group the same amount.

The different food types:	Provides	Sources	Should contain % of the diet
Carbohydrates	Provides energy and body heat. The carbohydrates reach the cells as glucose.	Honey, wheat, barley, potato, bread.	50 %
Fats and oils	Keeping body heat provides twice as much energy from it as carbohydrates.	Oil, milk, eggs, sugarcane, bananas, bread.	15%
Proteins	For growth and/or to replace cells and other body parts; it keeps us healthy.	Protein we get from animals (milk, meat, fish, and eggs). Amino acids and protein we get from vegetables (lentils, cereals, peas).	20%
Minerals	Does not give energy and do not contain carbon like the other groups. Minerals do not have to be digested.	Calcium, iron, phosphorus, sodium, iodine, potash, fluoride, chlorine, salt. Example: salt on daily basis 0.5 gram.	Small amount.
Vitamins	It helps the body and body parts to function properly. There are vitamins made in the body for example vitamin D and ones taken in.	Vegetables, fruits, fish, meat and milk also contain vitamins. When we boil, peel, when we harvest when it is not ripe and long transportation, keep in fridge, when stored for a long time the food the vitamin amount decreases.	No recommendation about how much to eat.
Water	Water is the most important	It facilitates digestion and	No

	<p>thing to life next to oxygen. Without food you can stay for weeks but without water you may die in a few days. It is part of our body.</p>	<p>transport the digested food to the blood. The activities in our body take place if there is enough water, we use water to get rid of our waste in the body and it helps us to keep body heat on normal.</p>	<p>recommendation of amount.</p>
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Biology in grade eight

The book of biology in grade eight contains the following subjects: unit 1: Organism and human and health, unit 2: Human being and disease, unit 3: Flowering plants, unit 4: Photosynthesis, unit 5: Our environment and unit 6: Classification of plants. In none of these chapters they learn about food, food production or nutrition.

4.5.4 Environmental education and protection programme

The Education and Protection Curriculum is written by UNICEF and the Tigray Bureau of Education; it is an extra and not obligatory curriculum, though there is an attempt to include it in the curriculum. The curriculum is part of a bigger programme which focusses on environmental clubs, education about environment protection and school gardens. The project has now been running for three years.

UNICEF also runs projects that educate children about hygiene and nutrition. The courses are about social protection; water and sanitation (WASH); nutrition education and health; capacity building for teachers and support for girls (Mrs Ginet, 24 April 2013).

Within the Nutrition Education Project, UNICEF encourages school gardens in order to give the students and community an idea of how to grow their own vegetables. They teach basic knowledge about nutrition. They provide vitamin A and Iodine for pregnant woman and children under five years old and iron supplements for adolescent girls are provided by the health posts. They also organise projects about

sanitation and teaching how to prepare food. Health workers and nurses come to the school to teach and there are also ‘trainers of trainers’ (TOT). UNICEF works closely with the Bureau of Health and Bureau of Education at the *Woredas*. The Tigray Bureau of Education decides in which school UNICEF should do which project and UNICEF comes to carry out the project (Mrs Ginet, 24 April 2013).

4.5.5 Summary and comments on the nutrition curriculum

The balanced diet and different food types is the most important subject of the nutrition curriculum. In every year the subject is repeated and explained in more detail. The level of complication and detail of the lessons increase as expected, but in some cases also creates confusion due to the gap between the simple explanations in the earlier grades and the explanation in higher grades.

Other subjects are hygiene, hand washing before and after food and how to prepare food; environmental protection and food production. The curriculum is connected to nature and teaches the students where food comes from and how they can produce it. The global food system and food produced and packed in factories are not subjects of the curriculum.

According to the curriculum and implementation performer at the Tigray Bureau of Education, the main pillars of the nutrition curriculum are the different food types, sources of food, foods which provide energy, how to eat in order to prevent disease and deficiency diseases related to malnutrition. Along the grades the complexity of the material increases. The message he wants to teach the children about food is the importance of food to the body; how to prevent diseases and how to eat a balanced diet (A. Adane, 20 May 2013).

Points of Strength

According to the curriculum and implementation performer at the Tigray Bureau of Education– the biggest advantage is that the curriculum is adjusted to the area in terms of culture, traditions and social and economic issues and that it is taught in the pupils’ mother-tongue (A. Adane, 20 May 2013).

Indeed this is a strong point of the curriculum; all the examples of foods are foods eaten in Tigray. Of course not all will always be available to every student but are at least familiar in the region. The examples of foods also are compatible with the culture, for example *injera* is often given as an example.

Points for improvement

The environmental teacher of the Nicolas Memorial School says that the definition of the balanced diet is confusing (when food in this context is only taught by specific categories) because food is described as belonging to certain categories carbohydrates, proteins, vitamins and fats. For example, meat can contain lipids (fats) and proteins. Banana is also difficult because it can be put in two categories. This is difficult for students to understand and should be explained better and in more detail (H. Gebrzigabiher, 14 May 2013).

According to the Environmental Science teacher of the Nicolas Memorial School, there is a new curriculum for Environmental Science, and it needs to be improved. In Grade four they learn about vitamins and minerals; in the old curriculum this was very detailed but in the new curriculum it has been removed. The teacher thinks this information is lacking now and teaches it broadly on his own initiative. The books went from 40 chapters to four but the contact hours stayed the same. There is much less content in the curriculum, but the contact time is the same (H. Gebrzigabiher, 14 May 2013).

The content of the curriculum is “ok” according to the curriculum and implementation performer at the Tigray Bureau of Education, but the layout and design of the text books could be improved. Much is in black and white and the same pictures are used for all the grades; they have challenges with designers and the lay out of the book. The new books for high schools are better (A. Adane, 20 May 2013).

Children learn about food in Grades 1-4 and 7, so the focus of the nutrition curriculum is in the lower grades, in my opinion this should be more balanced in order for the children to remember the content better.

‘The biggest challenge regarding to nutrition education is that you teach something that might not be available to the people’ (Gennet UNICEF, 2013).

Even when the curriculum is adjusted to fit the area, examples of foods eaten and available in Tigray are used, there are still ethical considerations. Should we educate children for a changing diet and teach them to choose foods which are not available to them? Do they learn about nutrition for a changing future?

4.6 Food at the school: the integration of the school garden; meals and nutrition curricula

The Tigray Bureau of Education is responsible for the nutrition curriculum. The feeding scheme is organised by the WFP which is responsible for the distribution and selection of the schools together with the Tigray Bureau of Education. School gardens are promoted by the Tigray Bureau of Education and several other organisations, like the WFP and UNICEF. The relation between the school gardens and the nutrition curriculum is the strongest; the feeding scheme is more independent. The curriculum and implementation performer at the Tigray Bureau of Education says they try to correlate the nutrition curriculum and the school garden. Some garden activities are included in the textbook like how to grow different vegetables in one’s own plot. Environmental Science touches different subjects such as agriculture, health *etc.* There might be some weaknesses in the integration but there is an evident attempt (A. Adane, 20 May 2013).

The school feeding is more independent of the other two subjects because it is managed by a different organisation:

‘The theoretical information should be implemented practically. The biology teacher is responsible for the nutrition education as well as the garden. The school feeding is apart because it is organised by another organisation’ (T. Hadgu, 5 April 2013).

This quotation from Mr Hadgu summaries very clearly how the school garden, school feeding and nutrition curricula are integrated and what the potential is. It will be much easier to improve the integration between the nutrition curriculum and the school garden because they are organised and promoted by the Tigray Bureau of Education while the organisation of the school feeding lies with the WFP. Although they have several school garden projects, it is hard to find much inter-correlation.

The curriculum and implementation performer at the Tigray Bureau of Education says about the possible integration between school feeding and the nutrition curriculum:

'The purpose of school feeding is not the nutrition but to increase the enrolment of children in schools in poor areas. We could also use it to teach about nutrition but now the main goal is enrolment and reduction of absenteeism. There are no classes or explanations about the school feeding. There is no objective to teach children about the school feeding. There are only a few schools in Tigray which receive this food so it would be difficult to include it in the curriculum' (A. Adane, 20 May 2013, 2013).

The integration of the three areas is limited by practical implications like the small number schools in Tigray with a feeding scheme. The integration seems also to be more difficult when the different subjects are organised by different actors. In Chapter 5 this will be discussed more in detail.

4.7 Summary

In this chapter the food-related framework of primary schools in Tigray is provided. An overview of education and food security in Tigray is given; followed by information about school gardens, school feeding schemes and nutrition curricula. The chapter closes with a paragraph about the potential of the further integration of these three topics.

Tigray is struggling with food security but the situation is slowly improving as the last famine ended over 20 years ago. The diet of the people contains mostly carbohydrates and vegetable proteins. More fruit and vegetables should be eaten as this is directly

linked to the enhancement of learning and capability building. Meat and other dairy products are eaten when affordable. Over the years enrolment of children in primary education has improved in Tigray.

School gardens are set up by different organisations like the Tigray Bureau of Education, the WFP, FAO and other NGOs which support schools with seedlings, training and water management systems.

The school feeding scheme is primarily organised by the WFP. They provide selected rural schools with corn soya blend flour, oil and salt from which the schools make porridge for the students. I have only found two schools with other small programmes organised by the schools themselves. One of them is at the Nicolas Memorial School the programme of which will be described in detail in paragraph 5.3.

Nutrition is taught as part of Environmental Science in Grade1 - 4 and Biology in Grade 7. The main focus is on the different food types and how to compose a balanced diet out of them. Other subjects are hygiene, food production and sources of food.

There is definite potential for further integration of these three areas. The circumstances in the field show that this will primarily be possible between the nutrition curriculum and the school garden because they are both organised by the Tigray Bureau of Education and managed by the schools themselves. The WFP, which is the main provider of school meals, is seen as an outside organisation with its own agenda, thereby making integration with the other vectors difficult.

In Chapter 5 an analysis of interviews with principals of 14 schools in Tigray is given. The principals were interviewed about the school garden, feeding scheme, nutrition curriculum and the potential integration of these three areas. In this chapter of the research, an attempt is made to examine the general data presented above within specific selected schools and describe the nuances that come with the personal story of each setting.

Of the 14 schools, 2 were selected for more in-depth research. The research at the Nicolas Memorial School, based in Mekele, is described in Section 5.3. The other school is the Qihen Primary School, based in Qihen, of which the findings are described in Section 5.4.

Chapter 5: Case study - Interviews with Schools in Tigray

'If they learn how to take care of the environment they also learn how to take care of themselves' (principal Agula primary school).

5.1 Introduction

Chapter 5 is based on empirical data collection which took place in Tigray in April and May 2013. I visited 14 schools in Mekele, Wokro, Kilde Awalo and Hintalo Wajirat to interview relevant staff about school feeding, the school garden, the nutrition curriculum and how these three subjects relate to each other. One school did not have a school garden or a feeding scheme so most research results relate to 13 schools. The results of my analysis are described in section 5.2. The research at the 14 schools provides a framework to better understand the context around the two schools that were chosen for in-depth data collection.

The objective for this empirical section of the research was to investigate the status of school gardens, feeding scheme and nutrition curricula in schools in Tigray through interviews with different actors and school visits.

The schools visited were selected because they have a school garden and nutrition curricula and preferably also a feeding scheme. Another important parameter was the accessibility of the schools – both geographically and contact-wise. The travels to the schools were done by public transportation which is more time consuming in Ethiopia, especially to very rural areas. For some destinations hitchhikes were a good alternative and a fun, adventurous way to arrive. Making use of these forms of transportation I felt really connected to the area because we met people on the way – many interesting talks on the way, walked parts of the trip and had our breaks in local places. For one day a car of Mekele University was used.

My interpreter and I usually travelled to the schools without prior notice and were welcomed everywhere with time for an interview. It became evident that this is the

way things are done. People were very hospitable, welcoming and willing to participate in the interviews.

After I visited these 14 schools I selected two of them for an in-depth case study: Qihen Primary School in Qihen and the Nicolas Memorial School in Mekele. By interviewing teachers, cooks, parents and other people involved I got an inside view on how they teach children about food in the garden, what the feeding scheme consist of and the place of nutrition in the academic curriculum, investigating how these three areas are integrated with each other. All data collection was aimed towards answering the research question: to what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

The following part of the research contributes to the objective of presenting an in-depth case study of two schools each which have a school garden and investigating to what extent they utilise the school feeding programme and school garden to integrate food and nutrition studies into the curricula.

The two selected schools are fundamentally different from each other; I chose them in order to show the different examples that can be found in the region. The Nicolas Memorial School is a private school in an urban environment with foreign funding which is able to design its own feeding scheme and school garden. The Qihen Primary School is an example of a public school in rural Tigray which depends on funding from the Tigray Bureau of Education, NGOs and depends on the World Food Programme (WFP) for the feeding scheme; the school garden has been initiated by the teachers and principal. Both schools follow the same, standard curriculum about nutrition used in schools in Tigray.

Most interviewed people were selected based on their professional position: the principals, teachers of a topic related to food or the cooks of the feeding scheme. The parents in the community were chosen randomly. We walked through the village and asked the people we saw if we could interview them. Everybody was willing to participate, invited us to their home and gave us food and/or coffee.

My experiences as an interviewer were very positive, challenging and educational. People were really friendly and willing to participate. The challenge was to understand their way of communication, which is very indirect. I learnt a lot from working with an interpreter. The questions always had to be well planned, rather than spontaneous conversations and small-talk. The interpreter, Gebrekidan, did not only help me with translation of English but also explained me about village life. For example he advised me to bring coffee and sugar to thank the principal for her time. Traveling with him made it also possible to hitch-hike which I wouldn't have done alone. One of my challenges was to constantly keep an overview, know which information is still missing and anticipate how I will want to analyse the information. It also takes a while to fully understand and standardise all the raw data; I would have liked to spend more time on the integration of the three topics and the deeper understanding of the field. As a researcher you are the leader of the project and have to know what you want to do all the time; this project encouraged my leadership and initiative skills. My natural curiosity to learn and get to know other peoples life made me enjoy the fieldwork to the maximum. I loved to visit people, communicate, learn about differences and similarities and be able to ask all my questions, as a researcher with ultimately the benefit of my subjects in mind.

Section 5.2 describes the results of my visits to 14 schools. Section 5.3 describes the research at the Nicolas Memorial School and section 5.4 the research at the Qihen Primary School. Section 5.5 summaries and reflects back on the research question in light of the empirical findings.

5.2 Food gardens, feeding schemes and nutrition curricula in Tigray

I visited 14 schools of which two are private in the city of Mekele. All the other schools I visited are public schools. Seven schools are in villages and five in a small town. With the exception of one, all the schools are elementary schools and the two private schools also have high school and kindergarten. All the children follow a shift timetable which means they go to school either in the morning or in the afternoon. Only the private schools have a full timetable from the morning till the afternoon. All

the schools have between 550 and 1500 students; only two schools situated in Wokro, a small town have over 2000 students each.

At every school I interviewed the principal and asked the same questions about the school garden, nutrition curricula, school feeding scheme and the integration of these three areas. If referred to ‘the school’ it means in this case information I received from the principal during this interview. See appendix D for a detailed overview of the visits.

Table 13: School visits April and May 2013:

<u>Name School</u>	<u>Woreda</u>	<u>Village/Town/City</u>	<u>Number of students</u>	<u>Level of education</u>	<u>Public or Private</u>
Megabit 30	Wokro	Wokro - town	2112	Secondary	Public
Selama School	Wokro	Wokro - town	2312	Primary	Public school
Abre Atsbaha Primary School	Kilte Awalo	Abre Atsbaha - village	1375	Primary	Public school
Waza Complete Elementary School	Hintalo Wajirat	Waza - village	561	Primary	Public school
Zwan Albe Elementary School	Hintalo Wajirat	Iwane - town	1170	Primary	Public school
Iwane Primary School	Hintalo Wajirat	Iwane - town	1002	Primary	Public school
Nicolas Memorial School	Mekele)	Mekele - city	1187	Kindergarten, Primary and secondary	Private school

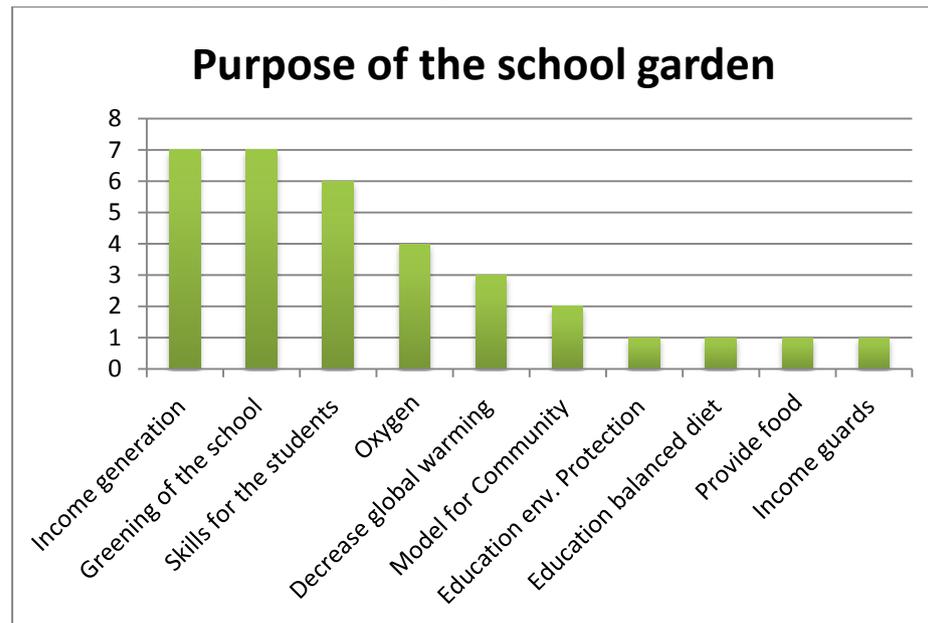
				education	
Qihen Primary School	Kilte Awalo	Qihen - village	641	Primary	Public school
Demaino Primary School	Atsbi Omberta	Demaino - village	667	Primary	Public school
Birke Primary School	Kilte Awalo	Birke - village	771	Primary	Public school
Agula Primary School	Kilte Awalo	Agula – town	919	Primary	Public school
Adi Awena Primary School	Hintalo Wajirat	Adi Awena - village	768	Primary	Public school
Gemelo Primary School	Hintalo Wajirat	Gemelo - village	637	Primary	Public school
Sheba Academy	Mekele	Mekele – city	1500	Kindergarten, Primary and secondary education	Private school

5.2.1 Trends and figures related to the garden

The purpose of the garden is primarily, as stated by seven out of 13 schools, to green the school, to serve as income generation for the school and for the students to learn skills about gardening which they can apply at home. Four schools name the importance of oxygen, shade and fresh air provided by the garden, while three stated the importance to protect the environment in order to decrease global warming. Besides the skills for gardening, two schools also point out that children learn about environmental protection from the garden and how to eat a balanced diet. At one school the purpose of the garden is extra income for the guards and cleaners and two schools say the garden is important because the school serves as a model for the community.

One school that I visited does not have a school garden although the Bureau of Education of Kilde Awalo would like the school to have one. The arguments of the principal are that the soil is not fertile enough for a garden and that the water available is too salty, including the water from the pump. The Kilde Awalo Bureau of Education provides training for the community, teachers and students of this particular school to make a garden at home.

Figure 6: Purpose of the School garden

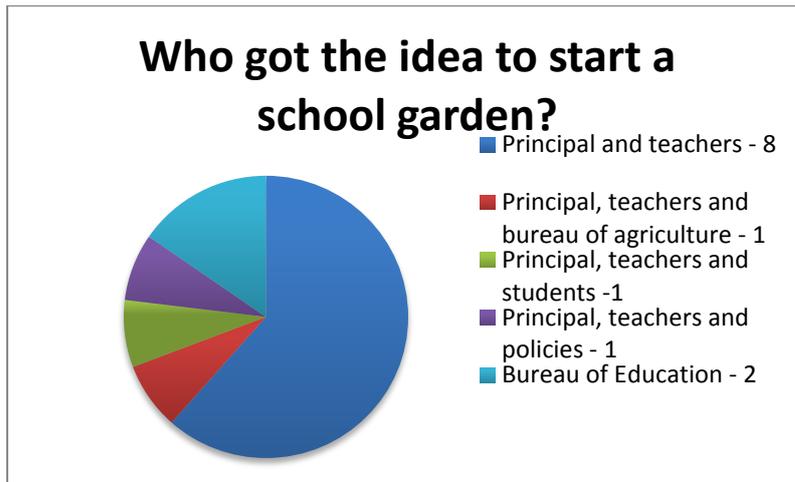


- Each school could give more answers; 13 schools participated.

The idea to start the garden

At 11 out of 13 schools the initiative of the school garden came from the principal and the teachers. At one of these 11 schools the vegetable garden was an idea of the students to generate income for students with HIV; producing grains was the teachers' idea. At one of these 11 schools the cows were the idea of the Tigray Bureau of Agriculture; one school said it got the idea also because of regional and federal policies and two said the Bureau of Education helped them with the initiative. Two schools reported the garden was an initiative of the Bureau of Education only. One school which we visited does not have a garden. This school told us the Bureau of Education wants them to make one but they do not believe the land is suitable and the water is too salty.

Figure 7: Initiative to start garden

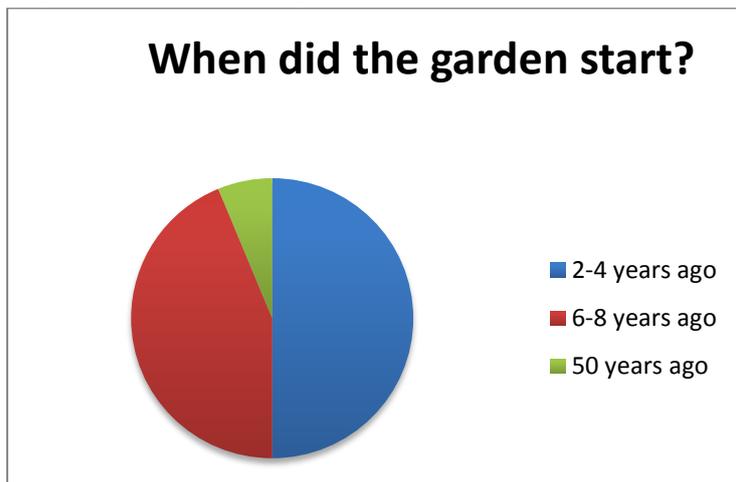


- Total: 13 schools.

When did the garden start?

From the 13 schools visited with a school garden most gardens are relatively new; at eight schools the garden was between two and four years old and four schools established the garden around seven years ago. One school was an exception to this; - the school garden was 50 years old. One could also see that it was a beautiful, wild and old garden and very big as well.

Figure 8: Start of the garden



- Total: 13 schools

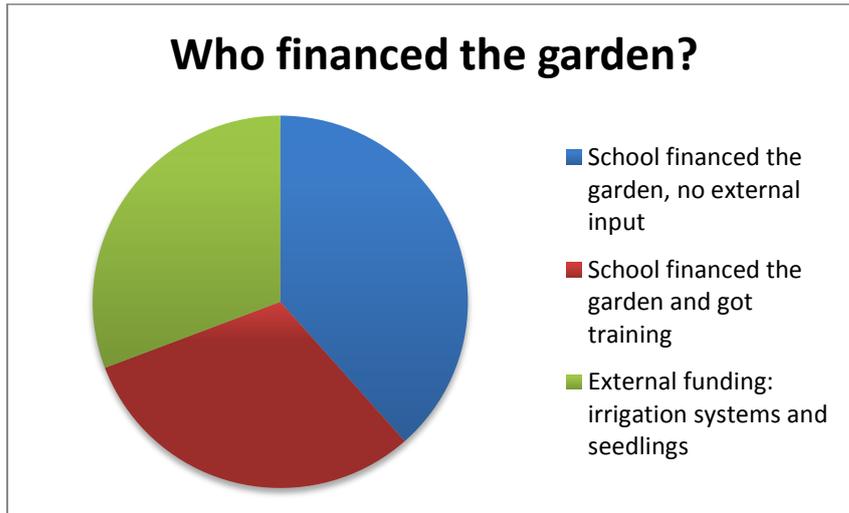
Photo3: School gardens



Who financed the garden?

Most schools, nine out of 13, did not get financial help for the garden. Four of these schools get training by the Bureau of Agriculture, two received training from the Woreda and NGOs. The four other schools got roof water catchments, water pumps and/or seedlings from different NGOs.

Figure 9: Finance garden



- Total: 13 schools.

What grows in the garden?

The schools grow vegetables like tomatoes, potatoes, onions, lettuce, spinach, carrots and maize. The fruits grown are guava, *trungi* (citrus medica), banana, mango, lemon, papaya and oranges. One school grows pomegranate and figs. Crops grown are barley, *teff* and wheat. Some schools have animals: cows for milk, oxen for fattening or sheep. Most schools have trees on their plot but for some it is really part of their garden and sometimes they also use the wood for sale. Guava is the most popular tree for the school garden: 12 out of 13 schools grow them. Nine of the 13 schools grow fruits, six of the schools grow vegetables, five grow trees, and three schools have cows for milk. One school had to sell their cattle because of a lack of food for the cows. Two schools have oxen and two have sheep. Three schools have crops like barley, *teff* and wheat, for which a bigger plot is needed.

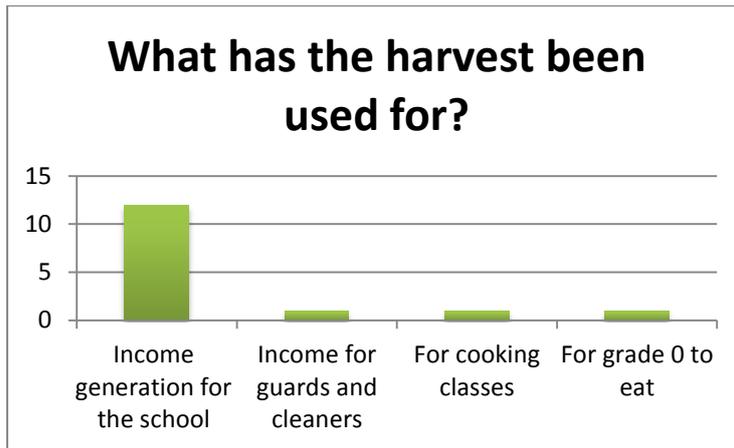
Figure 10: Crops in the garden

- Total: 13 schools: each school has a combination of these in the garden.

What has the harvest been used for?

The amount of harvest varies a lot, and thus so too does the profit which can be made from the garden, considering 12 out of 13 schools sell or want to sell the harvest as income generation for the school. The harvest is being sold on markets in the villages themselves or larger marketplaces nearby. Some schools give a reduced price for teachers and students. The income is used to buy school materials. Three schools also use the money to help underprivileged children, for example students with HIV. One school uses the harvest for grade-0 to eat and the money to reward teachers and students. One of the private schools in Mekele does not aspire to sell the harvest; they want the guards and cleaners to take care of the garden and they can keep the harvest as an extra income.

Figure 11: Use of harvest

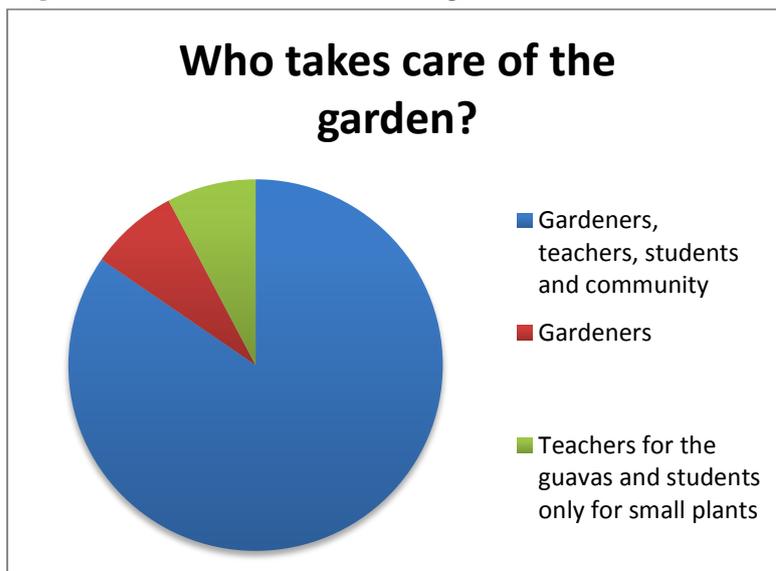


- Total: 13 schools; each school could have more answers.

Who takes care of the garden?

At most schools it is a combination of teachers, students, community and the guards of the schools who take care of the garden. At one school only gardeners take care of it. At another school the children are only allowed to take care of the small plants, the teachers take care of the big guava trees because the children would steal the fruits. The students of the environmental club usually work more in the garden than other students and/or they are responsible for parts of the garden.

Figure 12: Who takes care of the garden

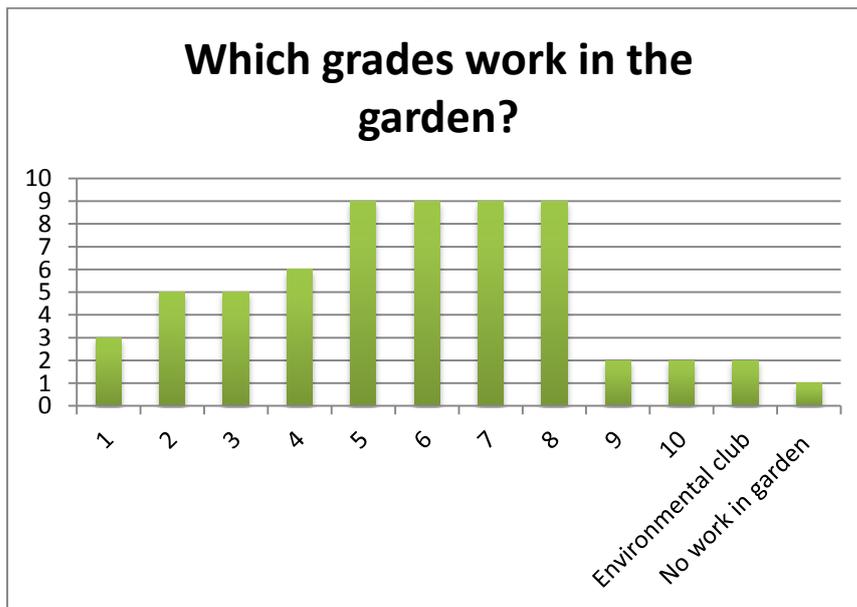


- Total: 13 schools

Which grades do work in the garden?

In most schools (12 out of 13) the children work in the garden; with age groups varying per school. In three schools grade 1-8 work in the garden; in three schools grade 5-8; in two schools grade 2-8 and in one school grade 4-8. Just in two schools only the members of the environmental club work in the garden. In the secondary school I visited grade nine and ten worked in the garden.

Figure 13: Grades that work in garden



- Total: 13 schools

How often do the students work in the garden?

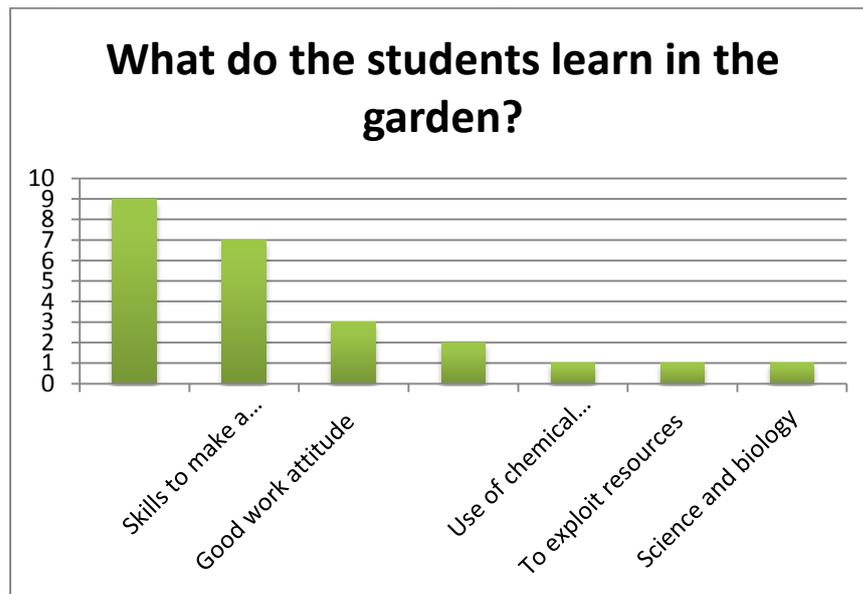
Many schools in rural areas do not have water at the school compound, neither for drinking, sanitation or the garden. At five of the visited schools the children bring water for the garden three times a week; to give the water and refresh the plants takes around 15 minutes. At one school the students do this every day and bring three litres each. At three schools only the members of the environmental club work in the garden, twice a week for 1.5 hours. At three schools the students work three times a week for one hour. At one school the children do not work in the garden.

What do the students learn in the garden?

The two most important things children learn in the garden are the skills to make their own garden at home (eight schools name this), and environmental protection (nine schools). One principal told us: *If they learn how to take care of the environment they*

also learn how to take care of themselves' (principal Agula primary school). Two schools name the importance of learning the different types of plants. One school puts forth the learning of how to use chemical fertilizer and to utilise your resources; for example by generating income from the garden. One school says they learn about biology and science. Three schools say the students learn also to respect work and that it can change your life.

Figure 14: What do students learn in garden

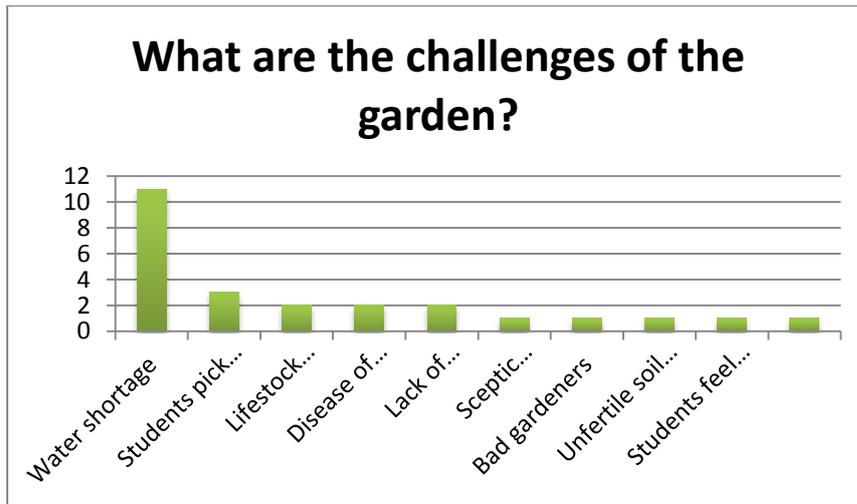


- Each school could give more answers; 13 schools participated.

What are the challenges of the garden?

Water shortage is the biggest challenge of the school gardens; 11 out of 13 schools name this as the biggest challenge for the garden. Some schools with an irrigation system still have challenges with water. Three schools said they have problems with students and/community stealing fruits or destroying the seedlings. In two schools livestock enters the garden and damages it, because of a lack of a good fence. Two schools said they had challenges with plant diseases. Two schools said they are challenged by a lack of knowledge about the soil type and suitable plants and trees for this soil. Other problems named by one school each are: bad gardeners, unfertile soil full of rocks and a lack of professional manpower which could improve the efficiency of the garden. One principal said a challenge was that the students could feel so hopeless by seeing the dry garden.

Figure 15: Challenges of garden



- Each school could give more answers; 13 schools participated.

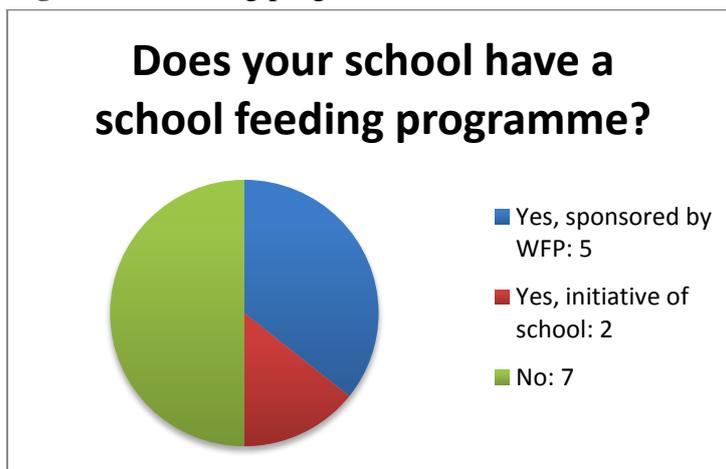
Photo 4: Watering the garden



5.2.2 Trends and figures related to the feeding scheme

Five of the visited schools have a school feeding programme sponsored by the WFP. At one of these schools the programme stopped temporarily due to distribution problems. Two of the schools have their own feeding scheme; both very different. At seven schools there are no feeding schemes, of which five are in an urban area and two in a rural area.

Figure 16: Feeding programme?

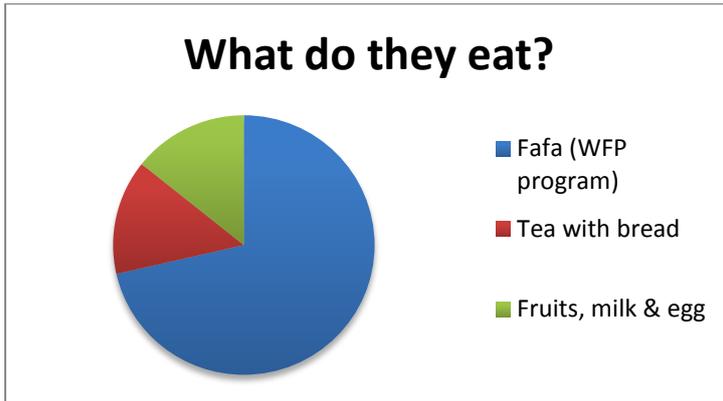


- Total: 14 schools

What do the students eat?

The feeding scheme sponsored by the WFP provides the school with '*fafa*'; they get corn-soya flour blend, oil and salt and the school prepares a kind of porridge from it for the children. At one of the schools with their own programme the children get tea and bread for lunch. The other school with their own feeding scheme provides fruits, egg and milk for the children as an addition to the diet which contains mostly carbohydrates and vegetable proteins. All the students of the school participate; some malnourished children get in addition 'plumpeanut', a product sold by the WFP for malnourished children and adults. It is a paste made of plums and peanuts for extra strength. The children get this snack at the break or lunch time, depending on the schedule.

Figure 17: Meal

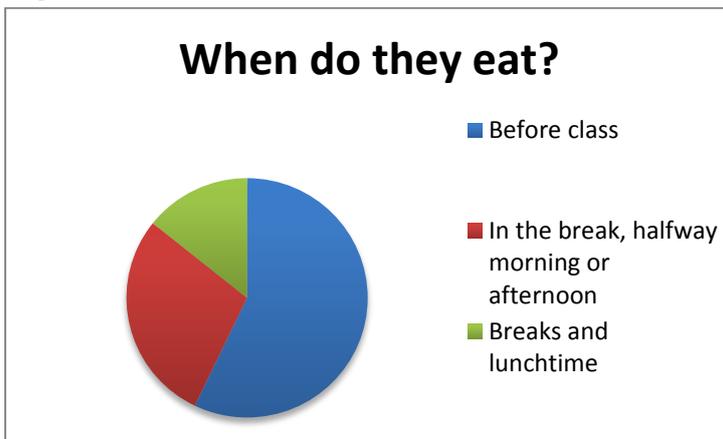


- Total: 7 schools
- *Fafa* is made of soya-corn blend flour mixed with water, oil and salt.

When do the students eat?

The children at the rural schools all come in shifts, so either in the morning or in the afternoon. At three of the schools with the WFP feeding scheme the children eat before class so the scheme constitutes of either breakfast or lunch. At two schools with the WFP feeding scheme they eat at break time (10.30 and 14.30) so the children will get new energy and it would not replace a meal that they would get at home. One of the schools with the own feeding scheme serve the food at lunchtime. The other school serves at lunchtime and breaks to the different grades so not all the students get the food at the same time.

Figure 18: When is the meal served?

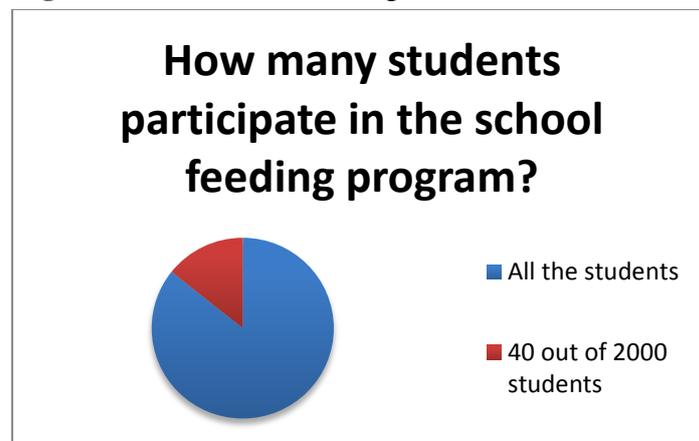


- Total: 7 schools

How many students are included in the programme?

All students of the school are included in the WFP feeding programme. Two schools have their own programme, one is included in the budget of the school (it is a private school so there is a bigger budget) and all students of the school participate in the programme and receive fruits, milk and eggs. The last programme is very small - only 40 out of 2000 children participate; the children get tea and bread for lunch. It is financed by the Tigray Development Association (TDA) and the community.

Figure 19: Students receiving meals



Total: 7 schools

When asked what the advantages of the programme are, the schools receiving the feeding scheme from the WFP told me that for students from poor households it is very important; there are less drop-outs from school and it improves enrolment. Students will be on time and be able to concentrate and focus in class and will stay longer at school for clubs and peer groups in which better students help the others. Aspects of the programme that could be improved are community cooperation, for example to provide the water as needed for the programme; sometimes they do not bring enough. The dining room has to be clean and for that the community has to be well integrated and help. The school feeding should also contain fruit. It would also be better to have a meal twice a day so it would be more attractive for the students to come to school. The distribution of the food must also be improved as it is often brought with a delay. These recommendations are given by the principals of schools with a WFP feeding scheme.

Photo 5: School meals



5.2.3 Trends and figures related to the nutrition curriculum and the integration

All the schools follow the standard Tigray curriculum regarding nutrition. Nutrition is taught as part of environmental science in grade 1-4 and in biology grade 7-8. They learn about a balanced diet and the different energy providers. Some schools organise extra activities to learn about nutrition beside the standard curriculum. One school teaches the children how to prepare alternatives to the '*fafa*' for once the WFP-school food will stop. For example they learn how to prepare porridge out of wheat, barley or finger millet. Schools see the target of the WFP as helping the students so the students should also help the WFP by being a good students and showing results otherwise aid will discontinue. Some schools use a poster from the Bureau of Health to teach how to feed children from 0-24 months old. At one school the Health centre comes to give additional classes about hygiene and a balanced diet. One school hopes to start with cooking classes next year.

I also asked the school principals if and how these three subjects, school garden, nutrition curriculum and school feeding, are integrated with each other. All principals said these topics are related; only one did not give an answer. Most of them, seven, point out that the children learn in the garden in practice what they learn in the classroom in theory. Four said they also learn from the '*fafa*' because it is an example of a balanced diet which they learn in class is important to take. The main argument for seeing '*fafa*' as a balanced diet is because it is made from diverse ingredients.

Photo 6: Nutrition curricula



5.2.4 Summary

Most schools started the garden in the last eight years with the purpose of generating income for the school; to teach children skills to make their own garden at home and to learn about environmental protection. Guava has been grown by almost all the schools. Besides that they grow other fruits and vegetables and a few schools have crops and animals. The biggest challenge of all gardens is the lack of fresh water; at several schools the children are responsible for bringing water from the well three times a week to water the plants.

If schools have a feeding scheme they mostly get food from the WFP. They get soya/corn flour, oil and salt and make porridge called '*fafa*' from it for the children. Meals are scheduled either before classes or in the break in between the classes. In general, all students of the school are entitled to food.

All the schools follow the standard Tigray curriculum in which nutrition education falls under environmental science in grade 1-4 and biology in grade seven and 8. Some schools organise extra activities to teach children about nutrition.

All the school principals say that the three topics – gardening, school feeding and nutrition education - are related to each other. Most of them point out the theory-to-practice correlation - a balanced diet, different food types etc. are explained in the classroom and experienced in practice in the garden, and during the meal. Some principals point out that the children experience the balanced diet when they eat '*fafa*' at school because it is made from different sources.

5.3 *Example one: Nicolas Memorial School*

5.3.1 Introduction

After the visits of 14 schools in the region I selected two of these schools for further research. The first school is the Nicolas Memorial School, a private school in Mekele; this school has been selected because of their alternative feeding programme, school garden and efforts to implement sustainable energy systems, compost toilets and water catchments in the school.

I visited the school eight times and spent around 15 hours at the school. I interviewed the principal, academic director and teachers and I observed the ecology club working; the school garden and the feeding programme. See appendix E for detailed information about my visits and time spent at the Nicolas Memorial School.

Table 14: Interviews at Nicolas Memorial School

Date	Interview	Participant
19 April and 10 May	Interview with academic director	T. Tamiru
13, 16 and 17 May	Interview with environmental and integrated science teacher	H. Gebrzigabiher
13 and 27 May	Interview with the principal	T. Hailemariam
27 May	Interview ecology club leader and biology teacher	Mr Mebratu

This section starts with a description of the Nicolas Memorial School, followed by the results of the research of the school garden; feeding scheme and nutrition curriculum. The section ends with a description of the community and their diet and the possibilities of further integration of the school garden, feeding scheme and nutrition curriculum.

5.3.2 Nicolas Memorial School

The Nicolas Memorial School is a private school in Mekele, owned by the Tigray war-veteran association and fully sponsored by the Rainbow for Children Foundation; founded in Switzerland and England (T. Tamiru, 19 April 2013). Because of the private funding making profits is not a core objective like it is for other private schools in Mekele. The school is named after the son of the owner of the foundation who died at the age of five (T. Hailemariam, 13 May 2013).

The school has 1187 students in kindergarten, primary school 1-8 and grade nine of high school (T. Tamiru, 19 April 2013). The children come every day from 7.30 till

16.15 which include the afterschool club activities (T. Tamiru, 19 April 2013). The school has 65 teachers. In primary school the limit is 40 children per class but in some classes there are 50 children. In high school the classes contain 30 children (T. Hailemariam, 13 May 2013). 890 children (75 per cent) are from members of the Tigray War Veteran Association. Out of these 890 members 310 students get sponsored with transport, fees and school materials. Their vision is to give qualitative education to disadvantaged children and to become the best school of Ethiopia (T. Tamiru, 19 April 2013). They are already in the top five and their laboratory is number one in Ethiopia according to the academic director. The kindergarten started five years ago, the primary three years ago and the high school last year. There are also plans to start a vocational training for after grade ten which will focus on job opportunities and the connection with the job market (T. Tamiru, 19 April 2013).

It is a challenge for the school to find qualified teachers. The principal wants everybody to have reasonable knowledge of computers and English (T. Hailemariam, 13 May 2013). Other challenges are that the curriculum is not contextualised enough to Ethiopia but rather a copy of curricula in Western countries and that many teachers do not really understand the concept of a curriculum and literally copy the book (T. Hailemariam, 13 May 2013). The biggest challenge is the connection between education and the labour market. The principal sees that universities face this challenge as well (T. Hailemariam, 13 May 2013).

5.3.3 The school garden at Nicolas Memorial School

The school garden at the Nicolas school started three years ago when they moved to the current building. The purpose of the garden is to teach children about ecology, eco-systems and the environment, and how to respect and live with nature. Not only this, but it is also for beauty and greening the school to improve the learning environment, and to provide shade. Every guest or newcomer to the school is attracted by the garden, so the garden appears to bring value to the school in different ways. The garden produces clean air and comfortable areas. Also the parents appreciate the garden (T. Tamiru, 19 April 2013).

They grow many types of vegetables, crops and guavas. One of the crops, a type of barley, is being sold for income generation for the school. The guavas are being used for the feeding scheme, if there is enough harvest. Otherwise teachers and workers eat the fruits. The gardeners take the vegetables home (T. Tamiru, 19 April 2013).

The idea for the garden came from the academic director and the Rainbow for Children foundation. The Tigray Bureau of Education promotes school gardens but was not involved in this one in particular. The garden is not as strong yet as he would like it to be (T. Tamiru, 19 April 2013).

Within the school budget a small part is allocated for the garden. Sometimes they get help from volunteers for the construction of several projects; for example by the construction of their compost toilets. The school wants to be off-grid in the future and uses already wind and solar energy on a small scale (T. Tamiru, 19 April 2013).

Photo 7: School garden at the Nicolas Memorial School



Students and the garden

According to academic director, until last year all the students used to work in the garden, but it did not work well. They worked in groups of 40 students of which half worked very well, but about a quarter was destroying the garden. It was not effective that all the students worked in the garden, despite the understanding and aspiration for all children to have gardening experience.

This year only the students from the ecology club work twice a week in the garden, and gardeners take care of it daily. The students learn in the garden about environmental protection. They learn dignity and respect for work, but students are not used as a workforce (T. Tamiru, 19 April 2013).

The ecology club has 16 members and meets on Wednesday and Friday to work for just more than one hour in the garden (H. Gebrzigabiher, 17 May 2013). The members, as well as eating guavas from the garden, are also encouraged to make a garden at home (Mebratu, 27 May 2013).

It is a popular club; with an appealing motivational basis that they can eat fruits and work with flowers, which children love. If they plant a plant or tree it gets named after them and the students really like this. The members come from grade four till nine (Mebratu, 27 May 2013).

The students learn at the club the name of every type of plant; where to plant different types of plants, sun/shade ratio, soil type, amount of water needed and about the reproduction of plants (Mebratu 27 May 2013). The activities of the club are watering, weeding, refreshing the plants, removing stones and plastic etc. and once in a while they hold a fieldtrip, for example now they are planning to go to a forest, two hours' drive away (H. Gebrzigabiher, 17 May 2013).

During the observation of the ecology club the children are expected to water the plants and they do this independently. They work as a group on it although there is not really work for everybody; groups of children hold the hose together. They have two points to take water from and all help each other or watch each other watering the plants (Observation of the ecology club with H. Gebrzigabiher, 17 May 2013).

Challenges and opportunities

In the past the garden was challenged by a lack of knowledge about soil and plant types. For example, trees were planted which require a lot of water and do not allow other plants to flourish around them. Now they have removed these trees. Last year they reportedly had bad gardeners who were lazy and did not do their job properly so plants were dying, but this year they have a good team. Another challenge is that some students destroy seedlings and steal unripe guavas (T. Hailemariam, 27 May 2013).

Both the academic director and the principal would like to use the harvest of the school for the feeding scheme but the challenge is to generate enough harvest because there are so many students attending the school (T. Tamiru, 19 April 2013 and T. Hailemariam, 27 May 2013). The solution of the principal would be to use it first for a meal for the malnourished, underweight children which possibly have HIV. These children get '*plumpeanut*' (a product sold by the WFP for malnourished children and adults) at the moment, but it could potentially be replaced with vegetables from the garden (T. Hailemariam, 27 May 2013).

If the garden could generate income for the school it could be a backup for if the funding will stop once, something you always have to be prepared for according to the principal even if there is a commitment (T. Hailemariam, 27 May 2013).

Observation of the garden:

The school looks very different from rural schools; the buildings are four floors high and all well painted and in good condition. There is a nice playground which is quite green, and they have a sport field made of concrete. The school has a relatively big area for an urban school, though still smaller than in rural schools. There are several garden spaces. The main garden is in a closed area next to the playground. The other gardens are next to the playground and can be openly accessed. The garden contains mostly guava trees. Other than that they grow onions, spinach, carrots and other vegetables. Around the school buildings they have planted trees and flowers. There is also a playground with grass for kindergarten.

The school has a lot of water catchment areas, two modern ones which collect the water from the roof and one traditional one. Compost toilets are available for the high school of which they will use the compost for the garden in the future (these have just recently been built by a group of volunteers). They also compost leaves, paper and fruit and egg shells from the feeding scheme kitchen (H. Gebrzigabiher, 17 May 2013).

5.3.4 The feeding scheme at Nicolas Memorial School

The Nicolas Memorial School has a feeding scheme designed internally by the school and paid from its own budget. It is supplementary to the lunch students take from home, because according to the school it is important that the feeding programme does not come instead of food they would otherwise get from home (T. Tamiru, 19 April 2013).

Every week, children get a mango, a guava, an orange, some milk and an egg. If it is possible, the school wants to use only fruits from the garden in the future. All students get food from the feeding scheme; underweight students also receive '*plumpeanut*' - a shake high in proteins. The school buys this from the WFP which is a monetary challenge (T. Tamiru, 19 April 2013).

The Nicolas Memorial School did research together with the Foundation about which feeding scheme would be most appropriate (H. Gebrzigabiher, 16 May 2013). It is important that every child brings lunch, something that is monitored by the class manager. If a child did not bring lunch the school provides lunch for that day and calls the parents to discuss the subject. (T. Hailemariam, 27 May 2013). The teachers put each ten birr (\$0.50) a month in a pot to buy lunch for the children who do not bring lunch (H. Gebrzigabiher, 16 May 2013).

According to the principal, the feeding scheme has improved the concentration and behaviour of the children. It also decreased the number of children with fungi's in their face and underweight children are gaining weight according to him. The principal says that parents are not able to buy this type of food for their children. '*Our school is lucky to have such a lot of feeding*' (T. Hailemariam, 27 May 2013). The

school is very proud of their programme; the principal cannot think even of any improvements, other than using fruits from their own garden for the feeding scheme.

Observation of the feeding scheme (13 may 2013)

The eating space for the children is open - outside but covered with a roof. Half of the space is used by the kindergarten and there are small tables and chairs to sit down. The other half of the space has a tap and a place to serve the other classes' milk, fruits and eggs.

We visited the area at 10.30 when the children have their first break. The children from kindergarten eat their lunch which they brought from home. Many children brought pasta with a red sauce or rice. All the children sit down and eat calmly while chatting with each other. Every group has its own space to store the food in this room during the day.

Two grades from primary school get their additional food provided by the school. The other grades will get it during lunch break or the afternoon break. These two grades get a cup of milk. Three staff ladies are involved in organising the food. One lady is serving the milk and the children are all gathering around her. The atmosphere is good but not very organised. The children do not wait in line but all gather around the lady serving and they do not sit down with their cup of milk but rather stand around while drinking.

Photo 8: School meals at the Nicolas Memorial School



5.3.5 The nutrition curricula at Nicolas Memorial School

The Nicolas Memorial School follows the standard Tigray curriculum which means that nutrition education is part of environmental science and biology (T. Tamiru, 19 April 2013).

Next year the school would like to hire a nurse and to invite NGO's to come and give training about nutrition; also because nutrition and anti-worming for the children is a focus point of the Rainbow Foundation (T. Hailemariam, 27 May 2013). Next year they also hope to start a club for cooking classes (T. Tamiru, 19 April 2013). In order to improve the curriculum the team of teachers at Nicolas revises the books together and sometimes they modify a few pages to better fit their philosophy or needs (Mebratu, 27 May 2013).

Environmental science

The students learn of the types of nutrition and their importance, the sources of nutrition and the effect of deficiencies of nutrition. They learn about a balanced diet and its importance. The proportions of a balanced diet are, according to this curriculum: carbohydrates 50 per cent; proteins 20 per cent; lipids/fats/animal products 15 per cent and vitamins, minerals and water (H. Gebrzigabiher, 13 May 2013).

This year a new curriculum has been introduced, and the books on the subject went from 40 chapters to four but the contact hours stayed the same. The classes about vitamins and minerals in grade four are less detailed now. The environmental science teacher thinks this information is lacking now and he is teaching it on his own initiative. What they learn about agriculture is mostly history and general knowledge. (H. Gebrzigabiher 13 May 2013).

The balanced diet is clearly explained but sometimes it is confusing when food can be categorized in more than one group. For example, meat can contain lipids (fats) and proteins. Banana is also difficult because it can be put in two categories. This is difficult to understand for the young students and should be explained better and in more detail (H. Gebrzigabiher 13 May 2013).

The children try to change their diet according to what they learn in class. They also try to improve their hygiene to prevent diseases. Students are very keen about the environment and happy to clean up if they can (H. Gebrzigabiher 13 May 2013).

Challenges with the diet are that people eat too many carbohydrates because it is mostly available. People prefer white *teff* over red *teff*, although the latter is much healthier because it contains carbohydrates and iron (H. Gebrzigabiher 13 May 2013).

Biology

In biology class, the students learn about the same subjects as in environmental science but in more detail and with emphasis on the human body. They learn about the different types of food: carbohydrates, proteins, vitamins etc. and to categorize the food. They also learn which dish gives which type of energy. They learn how to

prepare food, how to boil it, wash it and about food hygiene. They also learn not to eat food when it goes bad, and to always check the quality of food and hygiene (Mebratu, 27 May 2013).

5.3.6 The veteran community

The social-economic situation of the veteran community varies a lot. Some are rich and some are very poor and live in very small houses mostly because they are disabled and/or unemployed. Some (mostly the disabled) live in social housing which they got from the government. Some of them got a house from the government but are still able to work so they are better off. Most veterans fought in the war against the Derg (the communist regime who was in power in Ethiopia from 1974 till 1991) which ended in 1991. Some of them fought in the Ethiopia-Eritrea war (1998 -2000). In general there is a good communication with the veteran association, which are the owners of the school, but often the Association's lack of knowledge in running a school is evident. One example includes that they do not understand why the school needs so many employees (T. Hailemariam, 27 May 2013).

Diet of the community

According to the principal and the environmental science teacher around a quarter of the students eat a balanced diet at home, another quarter eats mostly *injera* and *shiro* (largely proteins and carbohydrates which is not a balanced diet) and the other half of the students has a diet which is in between. Because the children who do not eat a balanced diet eat too much proteins and carbohydrates the school provides minerals and vitamins in the form of eggs, bananas, milk and oranges (H. Gebrzigabiher, 13 May and T. Hailemariam, 27 May 2013).

5.3.7 Integration of the garden, feeding and education

The school has more freedom than other schools to design their own programmes because of external funding. Therefore they were able to design a feeding scheme that meets the needs of their students and is self-sustaining.

Integration of the garden and the feeding scheme

The school organises both the garden and the feeding scheme and therefore sees much more the potential of combining the two than I have observed in other schools. They are one of the few schools that want to use the harvest for the feeding scheme, but also for them it is a challenge because of the number of students. The principal said they could use it for the children that receive ‘*plumpeanut*’ now, which is a costly product for the school. The Foundation who plans the budget of the school could give a financial incentive by for example not putting ‘*plumpeanut*’ in the budget but instead to increase the budget for the garden to use the harvest for the malnourished children of the school. The garden would be more economically viable than the imported product ‘*plumpeanut*’. So a financial incentive could improve the integration of the feeding scheme and the school garden. Their vision is to use the harvest of the garden for the feeding scheme but the question is how serious they are working on achieving this or if it is more a vision for the future.

Integration of the feeding scheme and the nutrition curriculum

The feeding scheme is designed in cooperation with teachers and the foundation. The teachers are proud of the programme and also teach in class why the students eat fruits, eggs and milk during lunch.

“The feeding scheme and biology are totally connected. We teach them in class why they get milk, fruits and eggs for lunch and what kind of energy they get from it. During lunch they learn about hygiene, sanitation and contamination: where and how to store the food so it does not get contaminated” (Biology teacher, Mebratu, 27 May 2013).

The sense of ownership the teachers feel about the feeding scheme improves the integration between the nutrition education and the feeding scheme. On the other hand, because it is not integrated in the official curriculum the integration could be further improved. It is a challenge for teachers to carry out extra-curricular activities.

The integration of the nutrition curriculum and the garden

The environmental teacher emphasised that there is no integration made in the curriculum so if there is any integration it is the own initiative of the teacher. He would like to see the school garden integrated in the nutrition curriculum:

“It would be good to integrate the garden more into the curriculum within the books. Growing your own vegetables and fruits is an easy way to create a balanced diet” (Environmental science teacher H. Gebrzigabiher, 13 May 2013).

The biology teacher, who is also the leader of the ecology club, goes outside to the garden with the students to study – for example, photosynthesis or determination of plants. The students also learn in the garden about soil types, types of flowers, biogas, compost, irrigation, erosion and the conservation of the soil.

“Yes there is a connection between the garden and the curriculum. Some students learn better if they see something in practice instead of only learning from the book, for example determination” (Biology teacher, Mebratu, 27 May 2013).

There is potential for integration but it would happen more effectively if the school incorporated it in their study plan, as now it seems to happen randomly on the own initiative of teachers.

Conclusion

There is a much potential for integration between the school garden, nutrition curriculum and the feeding scheme at the Nicholas Memorial School, mainly because they have more freedom to design their own programme than other schools due to the external funding. Another reason for the potential to leverage the integration is the vision of the principal and the motivated team of teachers; there is willingness to try out new things, think outside of the box and find new ways to deliver quality education. They showed that they think outside of the box by designing this feeding scheme which is fundamentally different from the feeding scheme of the WFP, which is the dominant scheme in other schools of the area.

“By default these three areas are related but I never thought about it, it is a very interesting new way of thinking” (T. Tamiru, 19 April 2013).

At the Nicolas Memorial School different examples of integration between the nutrition curricula, the garden and the feeding scheme can be found. There is also a high potential for further integration because they are designing the garden and feeding scheme themselves. The integration of the areas could be improved and be more conscious instead of an accidental integration that emerges from their constant interaction.

5.4 Example two: Qihen Primary School

5.4.1 Introduction

After the visits of 14 schools I selected two of them for further research; this section describes the research at the second school: Qihen Primary School. The school started a garden six years ago; participates in the feeding scheme sponsored by the WFP and teaches the standard curriculum for nutrition. I selected this school because it is an example of a public rural school in Tigray and because of the belief, amongst the principal and teachers, that a school garden is possible even in a very dry area with very little budget and materials. Another reason was the accessibility of the school as it is relatively close to the main road (20 minutes' walk).

I visited Qihen eight times and spent around 40 hours at the school and in the village to interview the principal, vice principal, teachers and cooks at the school and make observations. I also interviewed several people around the school; such as the parents and the *tabia* – municipality of the village. Observations of the garden, feeding schemes and the students working in the garden have been done as well. For a detailed overview of the interviews and visits see appendix F.

Table 15: Interviews at Qihen

Date	Interview	Participant
23 April, 9, 14, 15, 23, 28	Interview principal	Mrs T. Mikaele

May,		
9, 15, 23 May	Vice principal	Mr A. Hailu
9 May	Cooks WFP feeding scheme	Mrs T. Hailu and A. Gebreslasye
14 May	Coordinator environmental club	Mrs F. Hafteaggu
14 May	Biology teacher	Mrs A. Asai
15 May	Environmental science teacher	Mrs A. Gebre
21 May	Interview at Tabia office	Mrs K. Mebrahtu
21 May	Community member/parent	Mrs F. Gimeskel
21 May	Principal of Woreda Bureau of Education, Kilde Awalo	Mr Y. Kidan
28 May	Community member/parent	Mrs S. Tadele
28 May	Community member/parent	Mrs S. Amhare
28 May	Community member	Mrs Hadish

This section starts with the vision and trends at the Qihen Primary School; the school garden; feeding scheme and nutrition curriculum. Followed by a section about the *Tabia*, parents and the community with a focus on education, food and the diet of the community. The last part of the section is about the integration of the school garden, feeding scheme and nutrition curriculum and the potential for further integration.

5.4.2 Qihen Primary School

Qihen Primary School is situated in Qihen, a small village with 3333 inhabitants, which is 20 minutes' walk from the main road between Mekele and Wokro (K. Mebrahtu, 21 May 2013). The school has 641 students in grades 1-8 who come on a shift time table. Grades 1-4 alternate morning / afternoon shifts with grades 5-8 (T. Mikeale, 23 April 2013). Qihen lies in a very dry and rocky valley in between the hills and most people in the village are farmers (K. Mebrahtu, 21 May 2013).

The school has a garden with guava trees and other trees, though it is struggling with the drought. It contributes to the school by providing shade in this hot area. The school compound is big and includes besides the garden also a sport field. The size of the garden is around 30x10 meters. The school receives food for the children from the

World Food Programme (WFP). In the classroom, the standard Tigray curriculum is followed to learn about nutrition.

The major focus points of the school are to increase quality of education and regular attendance to the school. Besides these, there are smaller successes and areas for improvement. The budget of the school is provided by the Bureau of Education and they either get cash or materials. The budget is very limited, it includes the salaries, materials such as books, balls, pens and notebooks and furniture (A. Hailu, 9 May, 2013). There are 20 teachers working at this school of which 16 are female and four are male. The principal is a woman too, which is different from the other schools I visited.

Photo 9: Qihen Primary School



5.4.3 The school: vision & trends

According to the principal, the commendable points of 2012 were the decrease of dropouts and a decrease of early marriages in the village - is a reason for girls to quit school (T. Mikeale, 23 May, 2013). The vice-principal additionally mentions as strong points that the community helped the school last year - a store house for the food has been built with their help; that all books in the school are available; that the students have good ethics and behaviour and he compliments the teachers for their hard work and willingness to help the students outside the class with tutorials (A. Hailu, 23 May 2013).

The points for improvement according to the principal are the study and exam results, decreased absenteeism and to improve the future perspectives of the students. Most students have no idea what they can do in the future; they do not want to become farmers but rather work in road construction or transfer to work in Saudi Arabia as an attractive economic leverage opportunity (T. Mikeale, 23 May 2013). The vice-principal focusses especially on the expansion of the school; he wants more buildings, a better dining space and more teachers (A. Hailu, 23 May 2013). The installation of a water pipe/pump to the school has been planned by the government and the Swiss NGO Helvetas, but this goal has not materialised yet (A. Hailu 23 May 2013).

Next year the focus lies on bringing more students to the school as an estimated 300 children in Qihen are not attending school at all (the school currently has 657 enrolled students which is ~2/3 of the children for which the school is purposed to cater) (A. Hailu, 23 may, 2013).

The vision of the principal for this school is to establish itself as one that provides quality education with a focus on natural sciences and reading skills, and good exam results. The community would become more aware of the importance of education and better students will help the other students (T. Mikeale, 23 may 2013).

Absenteeism and drop-out rates:

The community is not sufficiently aware of the importance of education; the school aims to bring more children to school and prevent drop-outs (A. Hailu, 23 May 2013).

There are different reasons for children not attending school regularly. The first is that children often have to look after animals and help their parents. The second reason is that small children (grade 1-2) find the walk to school (+/-5 km) challenging and are allowed to opt for staying close to home and play. The final reason is that some simply do not like to come to school, a state that does not encounter sufficient control (A. Hailu 23 May 2013).

On an average day 590 children out of 657 come to school. Drop-out is less of a problem because of the efforts of the teachers and administration of the school to create awareness in the community. This year 53 students wanted to stop but 34 are back in school after a communicative process and so only 19 students dropped out. Also a lot of students do not come every day. The school tries to improve this by exercising communication channels in the community. They meet every month with the community and with the *Tabia* and report issues to the Bureau of Education (A. Hailu, 23 May, 2013).

The principal and vice-principal have a difference of opinion regarding the communication with the community, but they both agree that the drop-out rate is a challenge and that parents could assist more with it (A. Hailu, 23 May, 2013 and T. Mikeale, 23 May).

According to the principal, the communication with the community is very useful. The challenges are attendance rate and that parents are not assisting in pushing their children to do their homework (T. Mikeale, 23 May). According to the vice-principal, the communication with the community does not bear fruit and parents still prefer their children to focus on helping with the farmland and do not assign high value to formal education. The consequence is that children do not stay in school. (A. Hailu, 23 May 2013).

5.4.4 The school garden at Qihen Primary School

The garden was started six years ago (1999 Ethiopian year) through the initiative of school teachers. They started the garden without any financial help, receiving only

training from the Bureau of Agriculture for students of the environmental club and the teachers involved (T. Mikeale, 23 April 2013).

The teacher of Amharic and Tigrinya, who is also the coordinator of the environmental club, took the initiative for the garden after she got inspiration from visiting the garden of the school in Abre Atsbaha (one of the schools described in 5.2). She is very proud of the change achieved, from no plants, trees or any green areas around the school six years ago to a garden of pride (F. Hafteaggu, 2013).

“The success of the garden is all the trees and plants you see, I am very proud of how we succeeded to green the school” (F. Hafteaggu, 14 May 2013).

The purpose of the garden is to have a green environment; provide shade for the students to study and a platform to teach garden skills that can be applied at home. Students learn how to prepare a balanced diet from the garden and the garden is important for environmental protection (T. Mikeale, 23 April 2013).

In the garden they only grow guava trees and other trees. The school would like to expand the garden but that is a challenge because of the shortage of water, according to the principal, and because of a shortage of appropriate space, according to the environmental club leader (T. Mikeale, 23 April 2013 and F. Hafteaggu, 14 May 2013).

The garden was designed by community members. The leader of the environmental club does not know why they chose guava trees - the plants have yet to bear fruits, which is a big disappointment (F. Hafteaggu, 14 May 2013).

Once the garden provides a harvest, the school intends to sell it as income generation for buying materials, rewarding the students, helping the disabled children and feeding grade 0 students, as this would attract them to school. (F. Hafteaggu, 14 May 2013 and T. Mikeale, 23 April 2013).

Photo 10: School garden at Qihen Primary School



The students and the garden

The students of grades 2-8 work in the garden guided by the teachers. The coordinator of the environmental club and its 35 members are responsible for the garden. The students bring water three times per week from the well to the school to water the plants and they refresh the plants once a week; which means they take out the old leaves and take care of the swale around the plant (T. Mikeale, 23 April 2013).

The students learn practical skills from the garden like how to plant, water and refresh the plants and how to protect the environment from erosion. They will be able to apply these skills at home and teach the community (T. Mikeale, 23 April 2013). They also learn that a garden can be a source of income (F. Hafteaggu, 14 May 2013).

According to the coordinator of the environmental club the students have learnt from the garden that you can have a green patch within a very dry area. This seemed

unbelievable in the beginning. Now every student knows the value and feasibility of having a tree at home – this is also her advice for every student. When she does home visits she checks and asks where the tree has been planted. Children have to come up with the seeds or seedlings themselves. They think and learn about how to change the environment because of the garden at school and the tree at home. They learn that reality can change from seeing their environment change:

“The students see how a desert area can turn green: change can happen; also in their own life” (F. Hafteaggu, 14 May 2013).

The environmental club

The Environmental club has 62 members between grades 4-8. They come together on Wednesdays and Fridays for half an hour each time. Once a month they meet for two hours for more extensive activity. All the students in the school work in the garden in the morning or the later afternoon (F. Hafteaggu, 14 May 2013).

The focus of the environmental club is the garden: to refresh the plants and water them with water they bring from home because the school does not have water. Other activities are to clean and fix things around the school ground and to discuss how to prevent pollution of the environment. The club is made more popular by sometimes rewarding students with training, books or pens for the work they have done (F. Hafteaggu, 14 May 2013).

Mrs F. Hafteaggu chose to be the coordinator of the club because it makes her happy to protect the environment and work on the development of the school (F. Hafteaggu, 14 May 2013). Once a year they get training from the NGO Worldvision, in which they visit other, more successful, gardens, such the one in Arbe Atsbaha where use of compost was observed, and which led to a pit to be prepared in Qihen where they compost leaves and paper as this is their compostable waste. The coordinator of the environmental club agrees that dryness would be a challenge but they do not have any wet material to put in to the compost, because the school does not have any waste from fruits and or vegetables and the community uses these as animal food. Animal

manure would be useful, but this is also not accessible as the school failed to keep animals due to the water shortage (F. Hafteaggu, 14 May 2013).

How could the garden be improved?

The main challenge of the garden is the water shortage; the school does not have any water at the compound and the students have to bring the water (T. Mikeale, 23 April 2013 and F. Hafteaggu, 14 May 2013). According to the principal they do not have enough knowledge about the soil so they do not really know what to plant and the fence is not good so livestock enters and eats the plants (T. Mikeale, 23 April 2013).

Last year, just after the rainy season, they got a traditional water catchment; a hole in the ground with stone walls to keep the water; and two roof water catchments from the NGO Helvatas, which has several projects in the village. These have not yet been used because they were installed after the last rain season but the coordinator of the environmental club expects they will provide enough water for the garden. This water will not be suitable for drinking, only for the garden (F. Hafteaggu, 14 May 2013). The principal thinks that the water roof catchments and the waterhole will improve the garden dramatically, together with the scheduled assistance of the Bureau of Agriculture in planting more vegetables and fruits (T. Mikeale, 23 May 2013).

The vice principal thinks they can improve the garden by planting more plants and getting professional advice on which plants best match the soil and the environment. Another required improvement is to get rid of termites, which eats the plants' roots. The vice principal has submitted a query to the Bureau of Agriculture about it (A. Hailu, 23 of May 2013), though none of the other people I interviewed mentioned these insects.

Observation from the garden:

The school is set on a large plot of land, of which a large part is an open field, part of which is used as a sport ground. The garden is relatively small; the guava trees are planted in front of the classrooms. The school also has a closed area with trees planted around the school. The garden is dry and the effects of the water shortage can easily be seen.

There are 25 guava trees and some other trees grow in large pitches in front of the school buildings. The plants are big and look healthy and green. Behind the school buildings there is a closed patch of trees. The entrance to the school presents two rows of pines which lead you to the school buildings. On the outskirts of the school ground are acacias and Australian acacias. Most trees and plants, including the guavas grow in front of the school buildings, but plants and trees are scattered on the entire school grounds. A big tree grows in the space of the feeding scheme where the children have breakfast and lunch in its shade. The ground is sandy and dry; most stones are removed to dedicated patches. In the middle of the school ground lays a pile of hay - food for animals from the community. For water collection, the school has two water roof catchments and two traditional wells.

The shade of the trees is appreciated by both students and teachers and evidently necessary as well. Students gather under a tree to chat or do homework together. The teachers sit around the flag area (Ethiopia, Tigray) in the shade of a tree. Many birds are attracted by the trees, which gives a peaceful atmosphere when we sit here in the morning, waiting for our first interview of the day; illustrated by the sounds of children learning (Observation of the garden, 15 May 2013).

5.4.5 The feeding scheme at Qihen Primary School

Qihen Primary School participates in the school feeding programme of the WFP. The programme runs now for eight years and will continue at least for another two years. They do not know if it will continue afterwards. The children eat porridge which is made of soya corn blend flour, water, oil and salt. All students get this food (T. Mikeale, 23 April 2013). The children come to eat at 7.30 or 11.30 depending on the shift (morning / afternoon). The space in which food is served and consumed is very basic. It is an open space surrounded with simple stone walls and the children sit on large stones. The food is prepared in a simple metal 'shack'. The school is in discussion with different actors to facilitate building a better room. They turned to the community but it is difficult because labour, time, finance and materials are scarce for the local farmers. They are talking about it and maybe it will happen next year. They also asked the government, NGO's and other volunteers for help (A. Hailu, 9 May, 2013).

The continuation of the programme in Qihen depends on the compatibility of the living standard of the people with the WFP criteria. The principal expects it will continue, subject to a visit by a representative of the sponsor (T. Mikeale, 9 May 2013).

The children eat breakfast at home -*injera*, bread or roasted barley. They learn from the feeding scheme, according to the principal, to insist on a balanced diet and enough nutrition, learn how to prepare a similar porridge from barley at home. Vegetables are missing from the feeding scheme menu. Soya is not known in the Ethiopian kitchen and familiar only as a product from food aid, like in the school but also from food aid programmes for pregnant women (T. Mikeale, 9 May 2013).

The cooks of the feeding scheme think that the meal contains good ingredients. When asked about the lack of vegetables, their answer is that if it would be possible it would be very nice. Before '*fafa*' there was '*suco*' - a thin porridge with biscuits, this was better because it had more variation containing two different substances. The cooks also say the students really like the '*fafa*', often competing for who finishes first. From the beginning the taste is not strange, but over time they start to like it even more and more (T. Hailuand A. Gebreslasye, 9 May 2013).

Photo 11: School meals at Qihen Primary School



Challenges, improvements & strong points

The feeding scheme is very important for students from poor households and it reduces drop-outs from school (T. Mikeale, 23 April 2013). Cooks of the feeding scheme also emphasise the importance of the feeding scheme for children from poor families; the children are really waiting for it, they arrive hungry at school sometimes earlier than required. So the feeding scheme also prevents children coming late for class. The cooks said that because the colour of the flour varies, the source of nutrition also varies which make it an example of a balanced diet; which is an interesting but strange conclusion (T. Hailu and A. Gebreslasye, 9 May 2013).

The challenge according to the cooks is that sometimes distribution is delayed. A delivery is expected by semester start and that does not always happen (T. Hailu and A. Gebreslasye, 9 May 2013).

The principal says the feeding scheme could be improved through a better cooperation with the community. For example, the community has to provide the water as needed for the programme. Sometimes the children do not bring enough water. The room where the children eat has to be clean and in order to be so the community had to be well integrated and help (T. Mikeale, 23 April 2013).

When asked for possible improvements to the feeding scheme, the vice principal responds that it cannot be changed and he cannot imagine they will ask him for advice about the feeding scheme. He tells me that the students ask for more diversity and variation, not the same food every day. His advice for the students then is to eat their own bread that day, and tomorrow the '*fafa*' again. I ask why the '*fafa*' is so dry and he says that the cooks are trained to make it like this (A. Hailu, 23 May 2013).

The principal also believes the feeding scheme could be improved by adding vegetables or fruits to the meal, like in Hawzen where the meal is complimented with an orange. She is sure they can buy enough fruits and vegetables in the area and improve the balanced diet of the meal. Her suggestion is that they would dry the vegetables and add the powder to the meal to make the distribution easier and solve the preservation challenge of fruits/vegetables (T. Mikeale, 23 May 2013).

Observation WFP feeding scheme: (11.00 o'clock 9 May 2013)

Preparation of the meal: The food is prepared by two ladies from the community who are also mothers to children at the school. The food is prepared on a wood fire and the ladies bring the water from the well every morning and every afternoon, 30 litre per round so in total 60 litre a day. They prepare 75 kilos of the fortified corn/soya blend which is produced in Ethiopia for WFP; the bag does not say where the food is grown. They use three litres oil a day and 500 gram salt which is made in Pakistan and the package shows the Canadian flag. The quantities of each ingredient consumed per student are 120 gram soya/corn blend, six ml oil and three gram salt.

At our observation lunch there were approximately 200 children, a relatively low number due to a holiday so children preferred to eat at home as the family prepared something special.

Atmosphere and serving: The children come in one by one and go to the cooks who sit in the little shack where the food is served. All children bring one branch of firewood (twice a week) and throw it in front of the shack. After the children get their plastic plate with '*fafa*' and a spoon they go to sit outside in the shade of a big tree; large stones set in lines serve as chairs. The atmosphere is remarkably calm and the children eat calmly and slowly. The children all observe us but are shy to talk even with the interpreter who is approaches them in their own language.

The food: They all eat '*fafa*' which is much dryer than regular porridge and looks more like a plate of flour. I also taste a little from a child and it tastes like dry corn flour but that could also be because I am not familiar with soya flour.

After the children finish their meal they throw the leftover '*fafa*' in a bucket, this will be given to animals, and the spoon and plate in a separate bucket. Not all children finish their plate as they head to the playground. The cooks will attend to the dishes afterwards. The food time slot is from 11.15 till 12.15, after which they go to class. The last children in line do not have time to finish their plate and hand it in to rush to class.

5.4.6 The nutrition curricula at Qihen Primary School

The school follows the standard Tigray curriculum in which children learn about nutrition within environmental science and biology (T. Mikeale, 23 April 2013).

Besides the standard curriculum the school has their own nutrition project every Friday. The students learn about how to prepare a balanced diet and how to create alternatives to the '*fafa*' for once the WFP-school food will stop. For example, preparing porridge out of wheat, barley or finger millet. The target of the WFP is to help the students so the students should also help the WFP by being good students, and helping WFP reach its educational goal (T. Mikeale, 23 April 2013).

Challenges, improvements & strong points

A strong point of the nutrition curriculum according to the vice principal is that teachers do home visits and give advice (A. Hailu, 23 May 2013). The biology teacher says that if the children know the balanced diet and eat according to it, it will improve their food system and protect them against diseases which are caused by the lack of a certain food type (A. Asai, 14 May 2013). The environmental science teacher claims that because most of the textbook is about balanced diet and health issues, after a while the community will adapt and change for the better (A. Gebre, 15 May 2013).

How could the nutrition curriculum be improved? The principal says that teachers should tell students and the community to have different types of crops, because they grow mainly wheat, this will make it easier to eat a 'balanced diet' and improve their nutrition. Students and farmers should also have a vegetable garden at home so they have to buy less at the market. Teachers could better explain the material if they had a laboratory to use and could explain in theory and show in practice (T. Mikeale, 23 May 2013). The vice principal said the curriculum should be more related with the nutrition of the children; sometimes the advice is to eat things they do not have at home (A. Hailu, 23 May 2013).

The biology teacher would like to have a laboratory because if she could show the students in practice they would remember it much better. For example how to determine the different food types such as carbohydrates, vitamins and proteins (A. Asai, 14 May 2013). The environmental science teacher shares the same point - a laboratory would enable to show the children in practice and widen the content. He would also like to see more pictures of the effects when one does not eat a balanced diet and more diagrams. The curriculum could be improved by learning more in practice and adding more illustrations (A. Gebre, 15 May 2013).

Environmental Science

The subject of Environmental science teaches the students about a balanced diet, nutrition and different food types and how food can protect the body from disease. One who is exposed to an unbalanced diet is likely to encounter both physical and mental development problems. The main focus of this environmental science teacher is to teach how to choose and prepare a balanced diet. He says they have all the ingredients to eat a balanced diet but the farmers prefer to sell the foods on the market

especially the best crop to earn money. He also teaches them that not every meal has to contain all the different food types in order to be part of a balanced diet. It does not mean that they have to eat meat or vegetables all the time but they have to combine and balance it. The reasons for not eating a balanced diet at home is the lack of awareness and the preference of the farmers to sell the good products like *teff* and honey (A. Gebre, 15 May 2013).

He emphasises to them to first take the best foods for themselves and sell the rest. This is also explained in the book but he makes a point to highlight it because he is from a farmer family and knows how this works and that it needs extra attention (A. Gebre, 15 May 2013).

The environmental science teacher recommends children to eat vegetables twice a week. Three times would be better but his advice also takes into consideration their realistic economic circumstances (A. Gebre, 15 May 2013).

Biology

Biology in grade seven teaches the children in detail about a balanced diet. They learn about carbohydrates, proteins, vitamins, energy, fats and water. The book explains that a balanced diet contains of 50 per cent carbohydrates, 15 per cent fat/oils, 20 per cent proteins and the rest minerals, vitamins and water. According to the book it is recommended to eat vegetables and fruits once a day (A. Asai, 14 May 2013).

The biology teacher hopes that the children apply at home what they learn in class about food and believes some will try. They do not have irrigation and therefore no gardens at home but at least they go once a week to the market to purchase some diverse foods, this is already an improvement. Hopefully when the children will have their own household they will apply the balanced diet. The curriculum teaches the children about agriculture and advices them to have a garden and plant a tree at their home (A. Asai, 14 May 2013).

5.4.7 The Tabia

The Tabia, the Ethiopian term for a small municipality, has 5320 citizens over 1050 households. The *Tabia* consists of six villages, of which Qihen is, by far, the largest with 3333 citizens and 650 households. Qihen is a veteran village (K. Mebrahtu, 21 May 2013). The community is close and most people marry within the Tabia. The population is orthodox Christian and the village prides itself with a church. It is a growing community. According to the Mrs Mebrahtu, working for the *tabia*, 85 per cent of the children follow school regularly. Almost everybody knows how to read and write and went to school, at least partially (K. Mebrahtu, 21 May 2013).

Most people work in agriculture and some work in a cobble stone business and sell the stones to places in Wokro, Mekele and Axum. For the transportation they cooperate with a private transportation company. Some people expatriate to Saudi Arabia, where they will work as a shepherd or housekeeper. The females mostly go legally and will work in housekeeping. The males go mostly illegally, which is a dangerous trip via Addis Ababa, Djibouti and then with the boat to Saudi Arabia where they will work as shepherds. This last year around 20 people left for Saudi Arabia. They send money home. Very few people work in the neighbouring cities - Wokro and Mekele (K. Mebrahtu, 21 May 2013).

Diet of the community:

The regular diet of the community contains bread, *injera*, roasted barley, porridge made of barley, wheat or *teff* (T. Hailu and A. Gebreslasye, 9 May 2013 and K. Mebrahtu, 21 May 2013 and A. Asai, 14 May 2013 and A. Gebre, 15 May 2013). The *injera* is mostly eaten with *shiro* - a warm paste made of lentils, grass peas and beans or flex which is similar to *shiro* but only made of peas. Milk and eggs are only available for rich families which have a cow. Meat is eaten on main holidays, chicken on less important ones. Less advantaged families share the goat, chicken or cow. Vegetables like cabbage, carrots, onions and potatoes are mainly eaten in the weekend upon return from the Saturday market in Agula, 30 minutes' walk away. People eat very few fruits, only sometimes lemon, oranges and beles (cactus fruit) and mainly in rain season. *Beles* (cactus fruit) is eaten a lot in season as it grows wild in the village

(T. Hailu and A. Gebreslasye, 9 May 2013 and A. Asai, 14 May 2013 and A. Gebre, 15 May 2013).

According to the cooks of the feeding scheme, this reality is not a good example of a balanced diet, as it is much too dependent on *injera* and *shiro*. The budget of the household makes it difficult to maintain the required diversity. I ask why they eat so little vegetables because these are not expensive. The cooks explain that *shiro* is also easy to make you only need the powder, oil, *berbere* (paprika powder) and water. While vegetable dishes need many ingredients and are more work to cook which is difficult if you are tired after a day of work (T. Hailu and A. Gebreslasye, 9 May 2013).

Most people do have enough food at home but sufficiency is difficult to determine when trying to take into account also the balance parameter (A. Asai, 14 May 2013). According to the environmental teacher, people do eat enough but the diet is not balanced enough (A. Gebre, 15 May 2013). Some students are mentally weak and he thinks it might be caused by the lack of a balanced diet (A. Gebre, 15 May 2013). Some people get food from the safety net (wheat, oil and lentils) so they have enough. The selection is based on a poverty criteria and the community leader helps with the selection (T. Hailu and A. Gebreslasye, 9 May 2013).

The farmers grow *teff*, barley, wheat, lentils, grass pea and during rainy season they grow tomatoes, potatoes, lettuce and spinach. The vegetables are mostly for self-consumption and if there is enough they are sold (T. Hailu and A. Gebreslasye, 9 May 2013).

The diet is changing as people start to eat more meat and vegetables, and get more knowledge about a good diet. The children learn about a balanced diet, nutrition and to wash their hands before and after every meal and each visit to the toilet. The community is influenced by these young change agents. Due to the influence of the school and the health centre almost everybody has their own toilet (latrine) now. The health centre also gives advice and classes at the school for children and teenagers. The health centre declared Fridays as the 'day of health' and one is supposed to clean

the house and personal environment as a direct contribution to their health (K. Mebrahtu, 21 May 2013).

Photo 12: Qihen



What are the current projects of the Tabia office?

The *Tabia* works together with other partners on several projects. They work with Helvetas, a Swiss NGO on the 'Beles project'. They support the growth of cactus fruit to sell it to Addis Ababa for juice which will be sold locally or exported. They also promote the leaf as a vegetable to be eaten by the community. They teach about how to green your environment and water and soil conservation. In the second phase they provide plots for young people to grow vegetables and cactus fruit and a tree called saltbush which provides environmental protection and food for the livestock. They also provide roof water catchments; introduced bees for honey and chickens to the community. They get the bee hives as a loan and pay them back gradually (K. Mebrahtu, 21 May 2013).

The Orthodox Church also has projects in the village for helping the poorest members of community. They provide for cooperation's goat, sheep and/or a mill house (for females); all of which are to be paid back on comfortable timetable terms (K. Mebrahtu, 21 May 2013).

The safety net programme provides food for the poor families in the Tabia; it is organised by REST and funded by USAID. 2450 people benefit from this, about 60 per cent of the beneficiaries three years ago. Per month the supply is 0.5 litre oil, 15 kg wheat from Canada/US, 1, 5 kg lentils per person and '*fafa*', intended for children under five. In exchange for the food people have to work five days a week for the municipalities or projects in the community, making this a form of salary (K. Mebrahtu, 21 May 2013). Chemical fertilizer is sold by the Bureau of Agriculture and used by almost all farmers (K. Mebrahtu, 21 May 2013).

5.4.8 The community and the parents

During my research in Qihen I spoke with six women from the community, of whom five have children attending the Qihen primary school. When we walked in the morning through the village we only met the women at home. Two of the women work as the cooks of the feeding scheme at school. I asked them about the diet of the family and what the children learn about food in school.

Mrs Hailu and Mrs Gebreslasye, cooks of the feeding scheme –9 May

They have both two children in the school. One has three children of which two are in school, the other one is 15 and living with his grandfather to take care of him so he does not go to school. The other one has four children of which two are in school; the other two are still too small. Grade 0 is for children of six years old.

One child, five years old, learned about the body parts and that it is important to eat eggs as part of a balanced diet. The child also learned to wash the hands and other things before you touch the food and wash dishes and it is important to use soap for cleaning. A balanced diet is food from different sources and contains fat, vitamins, protein and energy provider, the last has been eaten mostly. The child told her to eat carrots so your eyes will keep clean.

The children told her about the school garden. They have also their own garden at home, especially during rainy season. The family has to buy or give money for the children to buy seedlings. Children bring water to the school for cleaning and watering the trees, they bring it three times a week. On Tuesdays and Thursdays they bring a branch of firewood for the preparation of the '*fafa*'.

Her children like the feeding scheme that is also the reason that she is working there. She works as a cook to earn some money and also to be close to her children.

Mrs Amhare –21 May

Mrs Amhare is 50 years old, married to Mr Gebru and has six children all attending school. The family lives on a beautiful compound, built of stone and painted white and green. Around a patio they have a few rooms and place for cattle, I see three cows. Chickens with babies, a cat and a dog are hanging around. We sit in a simple but very nice decorated and clean room.

I ask her what she teaches her children about food, her response is: "*All the good things!*" "She wants to provide them with different crops like *teff*, barley and wheat and different foods like vegetables, eggs, milk and meat if possible.

When I ask about a garden at home she says: “*Of course we have a garden at home*”. They have a garden, not only because the children told her, but also because her husband is very active and one of the community leaders. He works also on the water and soil conservation project in Qihen. In the garden they have onion, beles (for many years already before the project started), eucalyptus, cabbage, lettuce, spinach; all mostly in the rainy season. They also grow crops, it is their main business, and they grow barley, wheat and *teff*.

The children all have a plant at school and take water for it; they have been told to make a garden at home as well. The children tell her to wash hands before and after food and a visit to the toilet. Food has to be clean and stored at a clean place. Meals also have to be taken at the right time. Sometimes Simrat goes to the *Tabia* for training and advice about nutrition.

The children like the ‘*fafa*’, the government is providing it and they eat it every day. I ask if it is not getting boring but she says it is not because it is only a small meal and only once a day. They eat three times per day at home and the ‘*fafa*’ is an additional meal. The ‘*fafa*’ is very good for the community, especially for those who do not have enough food.

Mrs Amhare and her husband also help the school because it is for their children.

After the interview I ask if it is ok to take a picture, she agrees and goes to change her clothes for the picture. She comes back in a blue traditional dress with golden earrings. After the picture she offers us coffee, her daughter-in-law comes to make the coffee, she is 19 and also her daughter with little son comes to join us. We drink coffee, according to Ethiopian culture we take three rounds of coffee so it takes a while, eat some bread, boiled wheat and Gebrekidan, my interpreter, drinks his glass of Soua, the local alcohol, I succeed to refuse. Also the mom and the girls coming from school drink a glass. We chat a little. She tells me about the ‘*beles project*’ in which they try to promote the leave as a vegetable. They make it sometimes with *tibbs* (pieces of roasted meat) or vegetables, but actually it needs a lot of other ingredients to make it tasty and she says they mainly eat it as a model for the community. It was a very nice visit with this very hospitable family.

Photo 13: First visit Qihen



Interview with Mrs Tadele – 28 May

We meet with Mrs Tadele on an early morning on our walk from the main road into the village to the school. The compound does not have the usual wall so we see her sitting, cleaning grain in a big basket. Her children and some neighbour children run around and try to catch our attention. Mrs Tadele is 30 years old, married and has five children; 11, nine, seven, five and two years old. Three children attend school; the oldest in grade four and two are still too young and will attend school later. Four children are at home at the moment, and one is at the field helping the father.

The family does mostly eat from their own farmland. They grow wheat, barley, sorghum and *teff*. The vegetables they eat are cabbage, carrot, spinach, lettuce, chillies, guavas and oranges but only if they have the money for it because these they have to buy on the market. They grow also pumpkins. The family has nine chickens. They do not have oxen, so they use oxen of other people to work on the land.

She teaches her children how to prepare the food because some foods take time to prepare and she has to teach them how to do it. She also teaches them time-management of the day; how to use your time to cook, study, fetch water etc. If they know how to manage their time it will help them in their future life.

The children told her they learn at school that they have to take a balanced diet and wash their hands before and after they eat food and the same if they go to the bathroom.

They recently moved from the other side of the village to this compound. In the other house her son has a small vegetable garden. They lived on the other side of the village with their parents and wanted a place for themselves. They chose this side because when the village will expand into a town this is a better location as it is closer to the road. They have a small room on one side of the compound with the kitchen and a bigger room on the other side. The compound is an open space and not closed with a wall.

The children told Mrs Tadele about the school garden that they have some vegetables, trees and guava plants but they did not give fruits yet. On Wednesday and Friday the children bring water to the school for the plants. They live in the higher part of the village, close to the school, but they have to go down into the valley to fetch the water.

Mrs Tadele says about the school feeding that they eat the '*fafa*' and like it and they thank the government very much for providing it. It is nice because it is made of different ingredients and varies from the food they eat at home. It is also good because the children be on time for class because of it. It is also helping the family because the children do not always eat lunch at home because of the '*fafa*'.

They have been asked by the school to help and sometimes they help planting and refreshing the plants. They have been also asked for money to build the storehouse for the food.

Photo 14: Second visit Qihen



Mrs Gimeskel the mother of the cook of the WFP feeding programme – 28 May
Walking through the village we meet two women and ask if we can interview them, this is ok and we follow them to their house. In the house lies a woman in bed and when she sits I recognise her as the cook of the school and I am surprised she is still in bed at 10.30. Then I understand that she just got a baby, four days ago! When I interviewed her three weeks ago I didn't even notice that she was pregnant. Now she lies in bed with a little boy and her youngest child, around two is sitting with her. She will stay for seven days in the bed and ten days after giving birth she will go back to work. Now her mom and sister came to visit her and take care of her. Another lady

also enters the room to visit her. They prepare porridge for us, one small one especially for the cook and a bigger one for the other guests. It is traditional porridge made of wheat and served with oil and *berbere*; they say it is good for the spine to recover after giving birth. The baby is lying next to his mom in bed, drinking and sleeping; he is really tiny, especially his legs.

Mrs Gimeskel is around 45 years old and has seven children of which the cook (30-35 she doesn't remember exactly) is the oldest. Three of her children are still in school, two in secondary school in Agula and one at primary school in Qihen.

They eat *injera* with stew or *shiro* and bread and sometimes meat and vegetables. During rainy season they have a vegetable garden. They have farmland where they grow crops and animals: a cow, oxen, donkeys, goats and chickens.

Once a week she goes to the market in Agula to sell crops. The amount of what she brings for sale varies and depends on the amount of money they need. It can be from ten kilo up to 100 kilo.

She teaches her children to eat different types of food, for example different food for breakfast, lunch and dinner. She also teaches them how to prepare food, especially the girls and how to clean the house and to manage their time.

They tell her what they learn in school about food and she tries to apply what she is able to. They tell her to eat vegetables and fruits and to eat a balanced diet; which does not mean that you have to eat meat all the time. They also told her about the importance of hygiene: to wash your clothes, take a shower, keeping the house clean and wash the hands before and after a meal and the toilet. What she does apply is to wash the hands before you touch the food and to wash the dishes before using, she learnt this from the children. What she does not always apply is to buy vegetables and meat, not because she does not want it but because she does not always have the money for it. She knows how important meat and vegetables are.

She knows that there is a garden at the school with some vegetables but she never really saw it. The children bring water in the jerry can for the plants.

The children tell her they like the food at school and it is good food. She wants to thank the government and the prime minister for providing the food. I ask her what they learn from the '*fafa*' but it is difficult for her to understand the question. Her answer is that she hopes that they will be good students and will help the community in the future.

They help the school with renewing the compound or with planting of trees. Sometimes they also go to meetings or discussions about the school.

Mrs Hadish – 28 May

Mrs Hadish came to visit the family; she does not have children therefore it was a short interview. She has farmland which she rent out and they share the produce. The man who ploughs the land decides what to grow, mostly barley, wheat and also some *teff*. She does not have any animals. She grows some vegetables, but only during rainy season, like cabbage, potatoes and tomatoes. She also sells her produce at the market in Agula, around three or four times per month. She sells to buy coffee and sugar, so she does not have to sell a lot.

Photo 15: Third visit Qihen



Summary

The diet of the community is mainly from the crops they grow: *teff*, wheat, barley, sorghum. Depending on their money they are able to buy, at the market in Agula once a week, vegetables and lentils for *shiro*. If they have animals they are also able to eat meat, milk and eggs. With holidays everybody tries to prepare meat; depending on their budget. During rainy season many people do have their own vegetable garden.

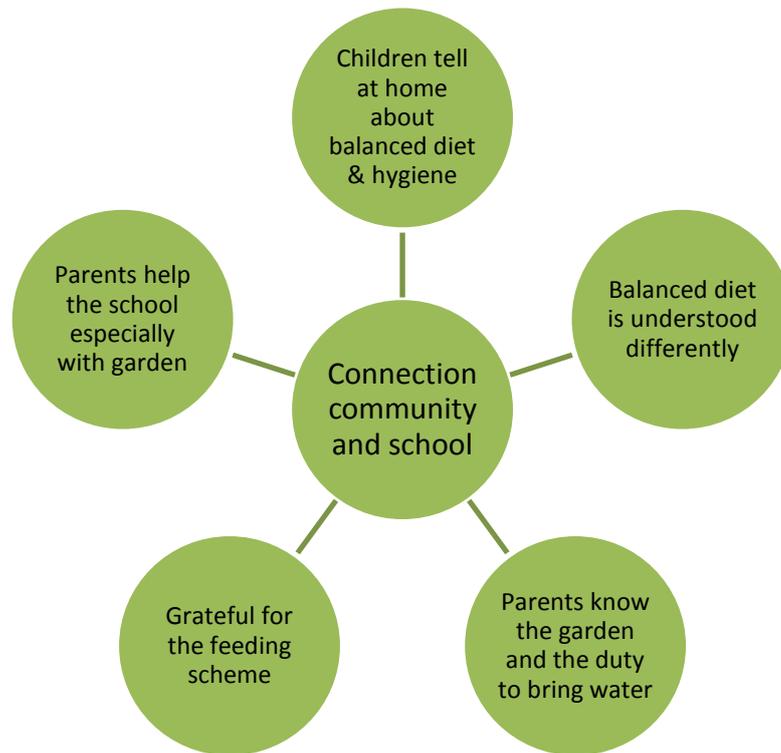
Figure 20: The diet of the community.



The children tell at home what they learn about food, they tell about the importance of a balanced diet and hygiene. It depends on the person to which detail they understand the idea of a balanced diet. Some people say it is only the importance to eat a meal from different ingredients while others understand more about how to balance the different food types. The parents know also about the school garden and that the children have to bring water for it. They appear very grateful for the feeding scheme and thank the government for it; but I am doubtful as to whether they would actually express any different opinion.

All the parents I have spoken to help the school, mainly with the garden. They plant new plants in the summer time and help to water them. Parents also helped the school financially by building a storing room for the school food.

Figure 21: The connection between community and school.



5.4.9 Integration of these three subjects

The principal, vice principal and the different teachers I interviewed all see linkages between these three subjects: the feeding scheme, nutrition curriculum and the school garden. All emphasise different aspects of the relations between the three.

According to the principal the three subjects are related:

“They learn from the feeding scheme and in theory about a balanced diet. Also from the garden they learn about a balanced diet but this would have been more if they had a bigger garden. The students learn about a balanced diet and can teach this their family at home. ‘Fafa’ is a balanced diet because it is from different ingredients” (T. Mikeale, 23 April 2013).

The viceprincipal emphasises another connection namely that children eat in clean air because of the garden:

“The garden and ‘fafa’ are linked to each other that the garden and shade of the trees makes that the children eat in the clean air. The garden and the nutrition curriculum are linked because plants are a source of food and health. The ‘fafa’ and nutrition curriculum are linked because the children have been thought to make porridge at home, similar to ‘fafa’” (A. Hailu, 23 May 2013).

The leader of the environmental club hopes that what they learn from the nutrition curriculum they apply it at home in practice in the form of a garden. According to her, the school feeding and garden are complementing each other; both have their own contribution to the understanding of the children of the balanced diet (F. Hafteaggu, 14 May 2013). The biology teacher says the feeding scheme and nutrition curriculum are strongly connected because the ‘fafa’ is an example of a balanced diet as it is made of different ingredients. According to her the garden and the curriculum are also connected, they learn in class about the balanced diet and will apply the garden at home, especially in and after the rainy season. The school garden is less connected because the guavas do not give fruits, but if they would students would see the advantages and if they would buy the fruits it would improve their diet and balance it more (A. Asai, 14 May 2013).

The environmental science teacher also sees the connection between the school garden and the nutrition curriculum. He says although the guavas in the school garden do not give fruit and the garden has a lack of water; they use it as a model to teach the children to make a garden at home (A. Gebre, 15 May 2013).

He also says the curriculum and the feeding scheme are connected because they both teach the students to eat a balanced diet. The feeding scheme surely is an example of a balanced diet because the WFP for sure thought about this he said. It could be improved by adding sugar and/or eggs because some students do not really like it and this would improve the taste.

Further integration

In order to integrate the three subjects further the nutrition curriculum should be more detailed and thought in a laboratory in order to teach them what to eat; on the 'fafa' should be written what it contains and every school should have a garden according to the principal (T. Mikeale, 23 May 2013). This shows for me that it is difficult for her to fully understand what the integration of the three areas could mean. She is used to think in different subjects of the school and not necessarily connect them.

The main focus of the school regarding to food is the knowledge about food:

“The main responsibility regarding to food of the school is that the students have good knowledge food so later they can help themselves and the country” (T. Mikeale, 23 May 2013).

According to the principal school feeding is not the responsibility of the school and will stop if the project of the WFP stops. Not necessarily because she does not think it is the responsibility of the school but also because she does not know how the school could be able, practically, to provide food:

“Is the school responsible to provide food for the children? Not really, when the NGO leaves the feeding scheme will stop. The main task is the knowledge and education about food. The second task is the feeding scheme but it is an addition. “How can I say different because if it is the task of the school and the WFP leave, what can we do?” (T. Mikeale, 23 May 2013).

So the principal, vice principal and other teachers clearly see connections between the three subjects but how to actively integrate them is difficult for them to imagine. It feels almost like a new way of thinking.

The school does not feel that they have ownership over the feeding scheme, like in the Nicolas Memorial School. They see it a project, which they highly appreciate, from outside that enters the school and provides food for the children. They do not see less connection with it, but they do not see how they could actively be involved with it. I recommended the principal to give feedback to the WFP about the project, as I am

sure that the school has a lot of valuable knowledge about it, and she found that a real eye-opener and possibility.

5.5 Summary

The majority of the 14 visited schools organised the school garden on their own initiative to generate income for the school and to teach the students skills which they can apply at home. These home gardens would increase the food security of the family. Many gardens are supported with training, seedlings and water management systems by the Bureau of Agriculture and other NGOs. The schools grow vegetables, fruits and crops. Most gardens started between six and eight years ago.

All the schools follow the standard Tigray curriculum which teaches nutrition as part of environmental science in grade 1-4 and biology in grade 7. The focus lies on the explanation of a balanced diet, the different food types and hygiene.

Seven of the 14 visited schools did have a feeding scheme; at five schools it was organised by the WFP and two schools had their own programme. The WFP provides the school with a soya corn blend flour, oil and salt of which the schools make porridge for the students.

The nutrition curriculum is written by the Tigray Bureau of Education and standard for all the schools. The school feeding scheme is organised by the WFP, an outside NGO, which works for the distribution together with the Tigray Bureau of Education. The school garden is the own initiative of the school helped often with training, seedlings or water management systems by the Tigray Bureau of Education. In order to integrate these three subjects, actors from different sources have to come together and this is a challenge. It seems for the schools easier to connect the school garden and nutrition curriculum than to integrate the school food, because this is organised by a third party.

Nicolas Memorial School

The Nicolas Memorial School differs from other schools in the region. They do follow the standard Tigray curriculum but they set up the garden and the feeding scheme themselves. They are very proud of the feeding scheme which serves the children with complementary foods such as fruits, milk and eggs rather than a replacement of lunch. They have ownership over the programme as they designed it themselves, which also gives them more flexibility. The garden is also a big pride of the school but they could use the full potential of it better by using the harvest for the feeding scheme. The school is open to this concept; to integrate the garden with the feeding scheme although currently this would still be a challenge because of the required amount of garden produce.

At the Nicolas Memorial School integration between the three areas would be easier because they organise the different subjects but also for them it is still a new way of thinking; the integration of these food related areas in the school.

Qihen Primary School

Qihen Primary School is organised similarly to other rural schools. The feeding scheme is organised by the WFP; they follow the standard Tigray curriculum and they implemented the garden on their own initiative. The garden is the big pride of the school; it shows that change can happen because a dry area can become green. The feeding scheme is seen as a programme organised by an external organisation over which they do not have control or influence. The principal and teachers see the relations between the different subjects but it is a new way of thinking for them to actively work on the integration between these areas.

The parents seem to be connected to the school; children tell at home about the importance of a balanced diet and the school garden. Parents help the school financially and with their time when possible. The basic diet of the community is *injera* and *shiro*. Once a week they buy vegetables on the market and eat meat on holidays.

The principal and teachers see a connection between the garden, curriculum and feeding scheme. Integration between the three areas seems a new way of thinking which is challenging.

Conclusion

This empirical chapter describes the situation regarding school gardens, meals and nutrition curricula in elementary schools in East and Central Tigray. It shows the potential for integration, although it is a very new way of thinking. The communities, their lifestyle and diet around the schools have been described as well to understand the environment in which the schools are operating.

The insights of the two schools show the interest and potential for a further integration but at the same time also show how new this way of thinking is. It also shows how many different actors are involved which on one hand gives schools the feeling they do not have the power to design an integrated curriculum, but on the other shows there is a large array of powerful stakeholders, who can ignite change

The Nicolas Memorial School has more space to design their own programme due to private funding and their will to create a high quality school. They also showed their ability to create according to their opinion, as they have a feeding scheme which provides animal protein and vitamins instead of carbohydrates and vegetable proteins like the WFP programme.

For the team at Qihen Primary School it is more difficult to act out of the box due their dependency on the Bureau of Education for the budget and the WFP for the feeding scheme. The interest and willingness for further integration is there but to how to implement this new way of thinking is still a challenge.

As a whole, the schools visited showed interest in the different aspects of school food, and the integration between them. Prioritizing this interest and tying the different stakeholders together for integrative cooperation remains the challenge on the ground.

Chapter 6: The integration of school feeding programs, nutrition curricula and the school garden.

6.1 Introduction

This concluding chapter starts with a compact summary of the research followed by a conclusion and proposed way forward. Section 6.1 is the introduction; section 6.2 gives a summary of the results of the research about the school garden, feeding scheme and nutrition curriculum. Section 6.3 provides the conclusion. Section 6.4 focusses on the potential of integration in the future and the last section, 6.5, gives recommendations for further research.

The research question of this study is to what extent do two primary schools in central- and east Tigray (North Ethiopia) integrate the feeding scheme, school garden and nutrition curriculum?

The following research objectives are determined to answer the research question:

- Explore food and nutrition education in Africa, with a special focus on school feeding programmes in Ethiopia, as well as the challenges and achievements of these school feeding programmes;
- Describe examples of education programs which integrate school gardens, school feeding and nutrition programs, recognising the importance of sustainability;
- Investigate the status of school gardens, feeding scheme and nutrition curricula in schools in Tigray, Ethiopia through interviews with different actors and school visits;
- Present a case study of two schools each which have a school garden and investigate to what extent it utilises the school feeding programme and school garden to integrate food and nutrition studies into the curricula;
- Attempt to make useful recommendations that may influence further study in this arena.

6.2 Summary of the results

6.2.1 The school garden

Most school gardens were initiated by the principal and teachers of the schools and started in the last 6-8 years. The main motivations of the gardens are: income generation for the school, greening of the school compound and skills for the students to make a garden at home. Similar to the reasons for school gardens in developing countries given by the FAO (2010): gardens have been mainly used for vocational agricultural training and food production for consumption, cash and school meals (FAO, 2010). In all the schools the students work in the garden. In most schools complete grades are involved, only in a few schools only a selected group of students work in the garden. The biggest challenge of the garden is the access to water. Water is not widely available and irrigation systems and pumps are costly. Guava is the most commonly grown crop; besides that a wide variety of fruits and vegetables is grown.

It is important to teach the children about fruits and vegetables as many actors explained to me that the regular diet does not contain many fruits and vegetables. Even if the harvest of the garden is sold, the school garden provides a very necessary extra input of vegetables and fruits, as well as the educational value of exposure, to food insecure communities that do not eat enough of these. When children grow crops themselves they will be more likely to want to try eating these (Barlow, 2007; Barlow and Stone, 2011). School gardens are not monitored and evaluated in Tigray similar to the statement of the FAO that many garden projects lack monitoring and evaluation of the long-term impact (FAO, 2010).

The primary school in Qihen is an example of a rural school in a very dry area that tries to green the school with a garden. The school does not have running water and the students bring water for the garden 3 times a week. They mostly grow guavas and other trees. The school wants to show their students with the garden that change can happen, even in a very dry area, and if change can happen in the garden it can also happen in the life of every individual. The Nicolas Memorial School is situated in an urban environment, in Mekele, and water is available. The garden greens the school compound, and serves as a learning space for the students of the ecology club. In the

future ideally the harvest of the garden will be used for the feeding scheme of the school.

6.2.2 The feeding scheme

School feeding in Tigray is primarily organised by the World Food Program (WFP) which provide selected rural schools with soya corn blend flour, salt and oil from which the schools prepare porridge for the students. The goals of the WFP program are to increase enrolment and prevent drop-outs from school. Besides the school food of the WFP, I found two schools that organise their own program. The WFP does have initiatives to grow school food in the school gardens and later with local farmers: the sweet potato project. This is an example of integration between the school food and the garden.

Qihen Primary School is a typical example of a rural school receiving the school food from the WFP. The program runs now for 8 years at the school and will run for at least another 2 years. The diet of people in the village also contains mostly carbohydrates and vegetable proteins. The Nicolas Memorial School designed a program that is supplementary to the regular diet and which give children an example of how to design a balanced diet. The students receive fruits, egg and milk as an extra to the lunch they bring from home. The school makes sure the school food is additional to the food children receive from home, not taking its place.

An important question is what the nutritional needs of the children are at the moment. The food provided by the WFP focusses on survival and getting basic nutritional needs; the soya corn blend flour with salt and fortified oil provides the most basic nutritional needs. While the feeding scheme of the Nicolas Memorial School provides the children with vitamins and proteins in the form of milk, eggs and fruits. In their opinion children do eat carbohydrates and vegetable proteins, but miss vitamins and animal proteins in their diet. The school also aspires to teach the children about a balanced diet with this feeding scheme.

6.2.3 The nutrition curriculum

All the schools follow the standard Tigray curriculum in which nutrition education is part of environmental science in grade 1 - 4 and biology in grade 7. The focus lays on the explanation of different food types: carbohydrates, proteins, fats, vitamins and minerals and how to eat a balanced diet.

Education in Tigray does not contain many practical classes, only sport and gardening, of which the latter is extra-curricular. Many school garden projects face this challenge of not being a priority, as they are usually partly extra-curricular (FAO, 2010). Teachers do see the opportunities to use the garden for practical classes, especially biology, but this will happen only on their own initiative, not as part of the curriculum designed by the Bureau of Education. Research suggests a strong synergy between gardening and nutrition education (FAO, 2010). Nutrition education which focuses only on knowledge seldom transfers to practice and the effects on dietary practices of the school garden are much bigger when it is backed by nutrition education (FAO, 2010). The benefits to education and learning are increased when the school garden program is integrated in the curriculum (FAO, 2010).

6.3 Conclusion

There is potential for further integration in Tigray, Ethiopia between the school gardens; nutrition curriculum and school feeding but it will require a new way of thinking from the stakeholders involved and a visionary leadership to enable this. System thinking teaches us the roadmap to progress is addressing the situation from multiple levels and directions: bottom up, top down, inside out and outside in (Barlow and Stone, 2011). Ethiopia, an agriculture-based country, and Tigray in particular has been struggling with food security for decades (Van Der Veen and Tagel, 2011 and FAO, 2012). In an era where the world is facing frequent global food crises (Pollani, 2008), for a sustainable food system is an important focus.

Principals, teachers and other actors acknowledge the link between the areas but appear to work very little on integrating the areas further and better as this seems to be a new way of thinking in education in Tigray. The lack of integration of the three

discussed pillars is also because of the consideration of components as isolated independents, rather than interconnected parts of a whole system. Many studies speak about the positive influence on learning when integrating these areas. Most studies speak of integration of two areas; either meals and garden; garden and curriculum or meals and curriculum (Foeken, Owuor and Mwangi, 2007; Capra in Barlow, 2007; FAO, 2010; Center for Ecoliteracy, 2010). This research argues that a focus on the integration of the three areas would be even more useful. The complexity of the food web creates an opportunity for teaching sustainable development (Barlow and Stone, 2011). Food is central in children's lives and connected to merchandise and the global food system; so creating a learning opportunity (Barlow and Stone, 2011).

The three subjects are organised by different actors which makes integration a challenge. In this research, it has been observed that the school garden is mainly on the initiative of the principal and teachers of the school, promoted by the Bureau of Education. The feeding scheme is mainly organised by an external organisation, the WFP, whereby the Bureau of education is responsible for the distribution of the food. The curriculum is standard for all schools; written on federal level and adjusted to Tigray by the Bureau of Education of Tigray.

The curriculum teaches from the book and classroom exercises. If the garden is used for practical explanations it is the initiative of the teacher. The school garden is promoted by the Bureau of Education but it is not compulsory and the activities of the children in the garden are extra-curricular. The relation with the WFP is very much 'one direction', the school receives the package and does not give back any feedback, reflection nor is it asked for suggestions. In practice, if there is connection then it is between the school garden and curriculum as these originate from the same seed – an independent, long-term, educational initiative by the school for the school – while the feeding scheme from the WFP is an external, temporary (the contracts are for 5 years), non-integral program over which the school has little influence. Its goal is primarily not about food but about enrolment. The school does not feel they are part of it, but rather it appears to be parachuted on them as aid, and therefore also likely that little chance much of it or its lessons will be left once the aid/budget is terminated. Schools do have interesting information for the WFP about the school

feeding project and it would give the schools more ownership about the feeding scheme and incentive to be actively involved with it.

When questioned, it appears that principals and teachers alike see the relationships between these areas. In order to deepen the learning experience for all, it would appear that these relationships could be made far more explicit, conscious and better utilised by the schools. The opportunities are said to be seen if asked about, but do not appear otherwise to be present. Perhaps the research questioning may have generated insights in the participants themselves, as to creating more connected ways of teaching and learning in these crucial areas around food, nutrition and gardening. It is important to teach children in systems and relations in order to understand this increasingly complex world. Within a systems thinking perspective it is logical to link nutrition education, school garden and school feeding because it is a way to teach children about patterns, relations and linkages (Barlow and Stone, 2011 and Capra, 2009). Through gardening one learns at different levels about the cycles of life and his own part of this cycle through fulfilling the basic need for food. A strategy of integrating meals, gardening and the nutrition curriculum encourages a different paradigm of living and learning for sustainable futures. Furthermore, the children themselves will be taught to think in a complex manner, preparing them to approach the future, especially in this time of polycrises (Swilling and Annecke, 2012).

6.4 A possible way to integration

'Change can begin anywhere, but to be successful, innovations must have the support of stakeholders throughout the school system' (Ecoliteracy Center, 2010:20)

In order to create an integrated curriculum about food for schools in Tigray, North Ethiopia, meetings with the different stakeholders would be organised in which the different views; goals and framework can be created. It is important that the new curriculum has broad support and therefore it would best be co-created, involving all the different stakeholders. According to system theory; systems would be studied by considering the inter-relationships and interactions of the components which produce its organisational integrity and identity (Rountree, 1977). Feedback from schools,

parents and other community members would necessarily be involved. Besides involvement of all stakeholders there would also need careful co-ordination to implement this curriculum. The Bureau of Education seems to be most appropriate body to take this forward, as they have broad support and are the empowered governmental body that will also reap the fruit in the long term.

The new curriculum could be based on systems thinking which focuses on thinking in relations and networks instead of thinking in silos (Capra in Barlow, 2007; Capra, 2009). People would be trained in thinking in relations, cycles and connections in order to be able to understand this complex world (Capra, 2009). The central question should be how to optimise learning by integrating these three areas that all surround the core topic of food. This requires ‘out-of-the-box’ thinking; for example, seeing the concrete learning opportunities provided by the school meals.

The school could make use of the ‘hidden curriculum’; in other words the indirect lessons taught by schools through their actions, assumptions and structures (Perez-Rodrigo and Aranceta, 2001). For example, the message that breakfast is important when the school is providing these by the feeding scheme. Or that fruits are important when the school puts effort in growing them. These messages that connect the curriculum, garden and feeding scheme should correspond with each other (Barlow and Stone, 2011) and could be used to optimise learning opportunities. There should be consistency between what children are taught about health in the classroom and the messages and choices available to them in the lunchroom (Center for Ecoliteracy, 2010).

The feeding scheme

In order to design this integrated curriculum it is necessary to look critically at the feeding scheme and its objectives. At the moment the purpose of the feeding scheme is enrolment and decrease of drop-outs and it does not have primary nutritional goals; neither educational nor physical. The WFP shows interest in a more sustainable system by promoting school gardens and purchasing food from local farmers (Home Grown School Feeding Project) (WFP, 2013b). This is in line with a growing consensus that school feeding programmes need to become more economically sustainable and less dependent on foreign aid (Bundy et. al., 2009). The WFP might

chose for broader objectives of the school feeding in order to make it part of an integrated, sustainable education about food.

The federal government of Ethiopia would need to take a position on the importance of school feeding, the design, the scale and the continuation, stability and sustainability. At the moment only 5% of the primary schools in Ethiopia do have a feeding scheme (WFP, 2013); this makes it difficult to integrate into the national curriculum because many schools are not participating. Another point is that the WFP is an international organisation which has limited options in redesigning the national curriculum. This amplifies the necessity for bringing all stakeholders together, in order to build a shared understanding of the potential for real transformation if all were to participate in using what already exists to create new connections that would shift the status quo completely.

More emphasis could be placed on the learning opportunities about food of the feeding scheme. School meals provide the students with a full stomach but could also deepen the knowledge about food, where it comes from, and the environment (Center for Ecoliteracy, 2010). The message of the school feeding programme has to be clear and in line with the curriculum (Center for Ecoliteracy, 2010). Cooking is an example of cyclical work—after cooking a meal it will be eaten, after cleaning up it will get dirty again. Planting will be followed with harvest and with planting again (Capra in Barlow, 2007). This cycle provides an opportunity for learning about cycles, systems and sustainability.

In order to use the learning opportunities of the feeding scheme about food and system theory; the WFP and the Ethiopian government have to broaden their objectives of the school feeding scheme. The objectives could incorporate learning about food, the importance of regular meals, and better nutrition for the students and the food system as a whole.

The school garden

The garden could provide additional fruits and vegetables for the feeding scheme in order to teach children about nutrition and improve their nutritional status. The schools would need an incentive to do this because at the moment income generation

is most attractive as schools work with very small budgets. This in itself is not a problem, but the lack of nutrition for the children themselves is diminished. Schools also do not feel responsible for a feeding scheme as this is organised by the WFP. Would the WFP start using food grown from some pilot school gardens, and use the funding to pay the schools, at least to begin with, it would build a more sustainable model in the long term. It would also show the children and example of systems thinking in which relations and circles are central (Capra, 2009). Investing food systems in which the schools are located would be key to informing the multi-stakeholder group on the possibilities for further connections (eg with the local clinic, local authorities, even prisons – these connected, become useful markets for food gardens as they would also provide small funding to assist the schools).

At the moment it would be a very big challenge and for most schools impossible to provide a year round school feeding programme from the harvest of the garden, due to many students and a lack of irrigation. Other research shows also that for many places this is not realistic, Mulindwa *et. al.*, did research in Uganda about this possibility and argue that gardens can teach children about sustainable agricultural production but are not capable to sustain school feeding programmes (Mulindwa *et. al.*, 2013). The research done in Nakuru, Kenya shows an example of a city where almost all primary schools provide school meals from the garden year round (Foeken, Owuor and Mwangi, 2007). Tasting and cooking the self-grown food would teach children about life-cycles and introduce new crops to their diet (Barlow, 2007; Barlow and Stone, 2011). Gardening makes the web of life, the flow of energy and the cycles of nature understandable; this makes the school garden an important place to acquire ecoliteracy (Capra in Barlow, 2007 and Barlow and Stone, 2011). Research shows that the benefits to education and learning are increased when the school garden programme is integrated in the curriculum (FAO, 2010). The life cycle of an organism—the cycle of birth, growth, maturation, decline, death, and new growth of the next generation (Capra in Barlow, 2007), can be seen in the garden and used to learn about cycles, relations and sustainability.

This research shows that the potential and function of the garden in this area depends mainly on the availability of irrigation and visionary leadership within the school. Without irrigation the garden can generate income for the school and be used for the

educational purposes. It will be a big challenge to provide enough food for the feeding scheme, hereby taking in consideration the large numbers of children attending the schools. The garden could possibly provide part of the feeding scheme; this would work best if the schools would get an (financial) incentive to do so.

The nutrition curriculum

The nutrition curriculum would use the learning opportunities of the garden and the feeding scheme. Nutrition education is very important as poor nutrition knowledge is one of the main factors in the development of malnutrition (Oldewage-Theron and Egal, 2012). Although one has to be aware about the ethical issues to teach children with possible food shortages about a healthy, but for them in that moment unavailable, diet. However David *et al.* argue that although malnutrition and poor health are often caused by food shortages, other factors such as ignorance, illiteracy and traditional attitudes also play important roles (David *et. al.*, 2008). With knowledge, hunger is fought more effectively and sustainably, as people are empowered to produce their own food, instead of receiving food aid (David *et. al.*, 2008). This research argues that nutrition education is important but that the educators have to be aware of possible sensitive areas around food and health issues.

Many of the subjects taught can be shown and experienced in the garden and during meals. The curriculum written by the Bureau of Education of Tigray for environmental protection gives examples of practical learning and could be used for inspiration. As several sources show children learn much more from experiences rather than listening to an explanation (FAO, 2010; Snodgrass, 2012). Teachers would demonstrate the links explicitly and directly to the children, in the garden. Working in the garden would enable the children to explore the links for themselves, and form the basis for further work in the classroom. At the moment many teachers expect the children to see the link between, for example, the garden and the classes in the classroom by means of lecturing style lessons, divorced from real experience.

Many respondents of this research pointed out the practical learning opportunities of the garden and to a lesser extent the feeding scheme. The written curriculum could include practical exercises and classes organised in the garden and during the feeding scheme. The schools seem to be interested and aware of these possibilities and teach

in the garden now and then. By including it in the curriculum it can happen on a broader scale and the teachers will be supported, inspired and get time for these classes.

Summary

The integrated curriculum for food would maximise learning opportunities already existing in the schools with a garden, feeding scheme and nutrition curriculum. It will teach the children about the basics of systems thinking by showing them relations and teaching them life-cycles (Capra, 2009). Experiencing and practical learning will be integrated in the curriculum rather than being extra-curricular activities. Through teaching about cycles, relations and the connections of humans with the natural world children will gain knowledge about sustainability.

It is one of the important needs of today to redesign education for the purpose of creating ecological sustainable communities (Locke and Russo, 2013). ESD teaches about the balance human and economic well-being with cultural traditions and respect for the earth's resources (Segovia, 2010). The integration of the feeding scheme, school garden and curriculum maximise the learning opportunities already existing at the school; learning about food systems and system theory in general. Education for sustainable development teaches about the interconnectedness of all beings (Widhalm, 2011).

6.5 Areas for further research

Several areas would be interesting and relevant for further research. First of all to monitor and evaluate the effects and purposes of school gardens in Tigray. At the moment there is no organisation in Tigray that monitors the school gardens or keeps an overview of them. Such research would give a broader insight on the opportunities and challenges of school gardens and their possible integration with the feeding scheme and the nutrition curricula.

It would be also valuable to track the impact on the health of the children and communities involved in these different programmes. A comparison could be made

between schools with gardens and feeding schemes and schools with only one of the two, or such that examine the effects of different types of school gardens or feeding schemes.

Another interesting area for research is to investigate the interest for an integrated curriculum at policy making level in Ethiopia, as well as the vision for school feeding; school gardens and nutrition curriculum and the vision for education as a whole in Ethiopia. It would also be interesting and important to repeat this research on a larger scale (including more schools) to get a better overview of the potential integration.

Lastly, further work would focus on starting the process described in section 6.4; to bring all stakeholders of different levels together and start to develop an integrated view on education about food in Tigray which is based on systems thinking and teaching cycles and relations. This process could hopefully lead to a basic framework for an integrated curriculum where learning in the classroom is combined with outdoor, practical experiences.

‘Children are effective change agents and what they learn in school is likely to be transferred to the community’ (David, Kimiywe, Waudu & Orodho 2008:131)

I hope this research gave inspiration to develop ways to teach children about food and sustainability.

“To know the spirit of the place is to realise that you are a part of a part and that the whole is made of parts, each of which is whole.”
(Gary Snyder, 1990:38 in Williams and Brown, 2011)

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Interviews

Adane, A., curriculum and implementation performer, Tigray Bureau of Education, 20 May 2013

Amhare, S., community member/parent, Qihene, 28 May 2013

Arefine, Mr, coordinator Mekele office, Institute for Sustainable development, 1 April 2013

Asai, A., biology teacher, Qihen Primary School, 14 May 2013

Breda, van, J., Stellenbosch University, 21 November 2012

Gebre, A., environmental science teacher, Qihen Primary School, 15 May 2013

Gebreslasye, A., cook WFP feeding scheme, Qihen Primary School, 9 May 2013

Gebrzigabiher, H., environmental and integrated science teacher, Nicolas Memorial School, 13, 16 and 17 May 2013

Gimeskel, F., community member/parent, Qihen, 21 May 2013

Ginet, Mrs, coordinator environmental education, UNICEF Mekele, 24 April 2013

Hadgu, T., coordinator of environmental education, Tigray Bureau of Education, 5 April 2013

Hadish, B., community member, Qihen, 28 May 2013

Hafteaggu, F., coordinator environmental club, Qihen Primary School, 14 May 2013

Hailemariam, T., principal, Nicolas Memorial School, 13 and 27 May 2013

Hailu, A., vice principal, Qihen Primary School, 9, 15, 23 May

Hailu, T., cook WFP feeding scheme, Qihen Primary School, 9 May 2013

Kidan, Y., principal of Bureau of Education Kilte Awalo, 17 April and 21 May 2013

Mebrahtu, K., working at the Qihen Tabia office, 21 May 2013

Mebratu, Mr, ecology club leader and biology teacher, Nicolas Memorial School, 27 May 2013

Mesfin, A., head of WFP sub-regional office Mekele, 2 April and 13 May 2013

Mikaele, T., principal, Qihen Primary School, 23 April, 9, 14, 15, 23, 28 May 2013

Mohamed, A., project coordinator school feeding, Tigray Bureau of Education, 8 and 14 March, 10 May 2013

Tadele, S., community member/parent, Qihen, 28 May 2013

Tamiru, T., academic director, Nicolas Memorial School, 19 April and 10 May 2013

Appendices

Appendix A: Permission of Tigray Bureau of Education

Appendix B: Permission of research of Nicolas Memorial School and Qihen Primary School

Appendix C: Overview of interviewed officials of the Tigray Bureau of Education and NGOs

Appendix D: Overview of the visited schools

Appendix E: Overview of interviews at Nicolas Memorial School

Appendix F: Overview of interviews at Qihen Primary School

Appendix G: Questionnaire used for 14 schools

Appendix A: Permission of Tigray Bureau of Education



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Tigray Education Bureau



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To Kitte Amalelo wereda Education Office

WUKRO

Re: Getting a Permission letter to collect data In your schools

Mekelle University has asked our Bureau to produce a permission letter for Mrs Sofie Blom a master student in Mekelle University in order to collect data in the integration of nutrition education into school feeding programs in primary schools in your wereda.

Hence, I want to ask your office to facilitate and help her during data collection from wereda officials, School principals, teachers, and students in kehien -Abre Atsebeha, AGula & Brki Primary schools.

Best Regard

Banta w...
Process Development & Implementation





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Tigray Education Bureau



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ኣብ ርእሰ ዋኒኑ ከምዝተሓበረ ኣብ መቐለ ዩኒቨርሲቲ ተምሃሪት ካልኣይ ድግሪ ዝኾነት ተምሃሪት ሚስ ሶፊያ ብሎም ንመመሪቕኣ ተካይዶ ዕንዓት ኣብ ምግብና ዝተመሰረተ መረዳኣ ንምእካብ ትሕብብር ክንገብረላ መቐለ ዩኒቨርሲቲ ብቁጠራ ips/568/2013 ዕለት 07/05/2013 ኣፈ ብዝተፀሓፈ ደብዳቤ ሓቲቶምና ኣለዉ።

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Tigray Education Bureau



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To Hintalo waferet wereda Education Office

Adi Gudom

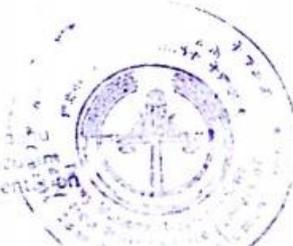
Re: Getting a Permission letter to collect data In your schools

Mekelle University has asked our Bureau to produce a permission letter for Mrs Sofie Blom a master student in Mekelle University in order to collect data in the integration of nutrition education into school feeding programs in primary schools in your wereda.

Hence, I want to ask your office to facilitate and help her during data collection from wereda officials, School principals, teachers, and students in Adi Awana - Hewane, Gimelo & Primary schools.

Best Regard

Anta Woldehanna
Deputy Director
Department of Implementation



Mekelle University  መቐለ ዩኒቨርሲቲ
INSTITUTE OF PEDAGOGICAL SCIENCES

Ref No. IPS/568/2013
Date:07/05/2013G.C

☎251-344-404614 Fax. +251-344-409304/401090
Mekelle – Ethiopia

To: the Bureau of Education

Mekelle

Re: Getting a permission letter to collect data in schools

Mrs. Sofie Blom is masters student in the University of Stellenbosch, South Africa, and she is here on student exchange basis. She is collecting data for her Masters entitled "The integration of nutrition education into school feeding programs: A case study of two schools in Ethiopia's primary school system" under my supervision. Hence I want to ask your office to get her a letter of permit to collect data in her sample schools.

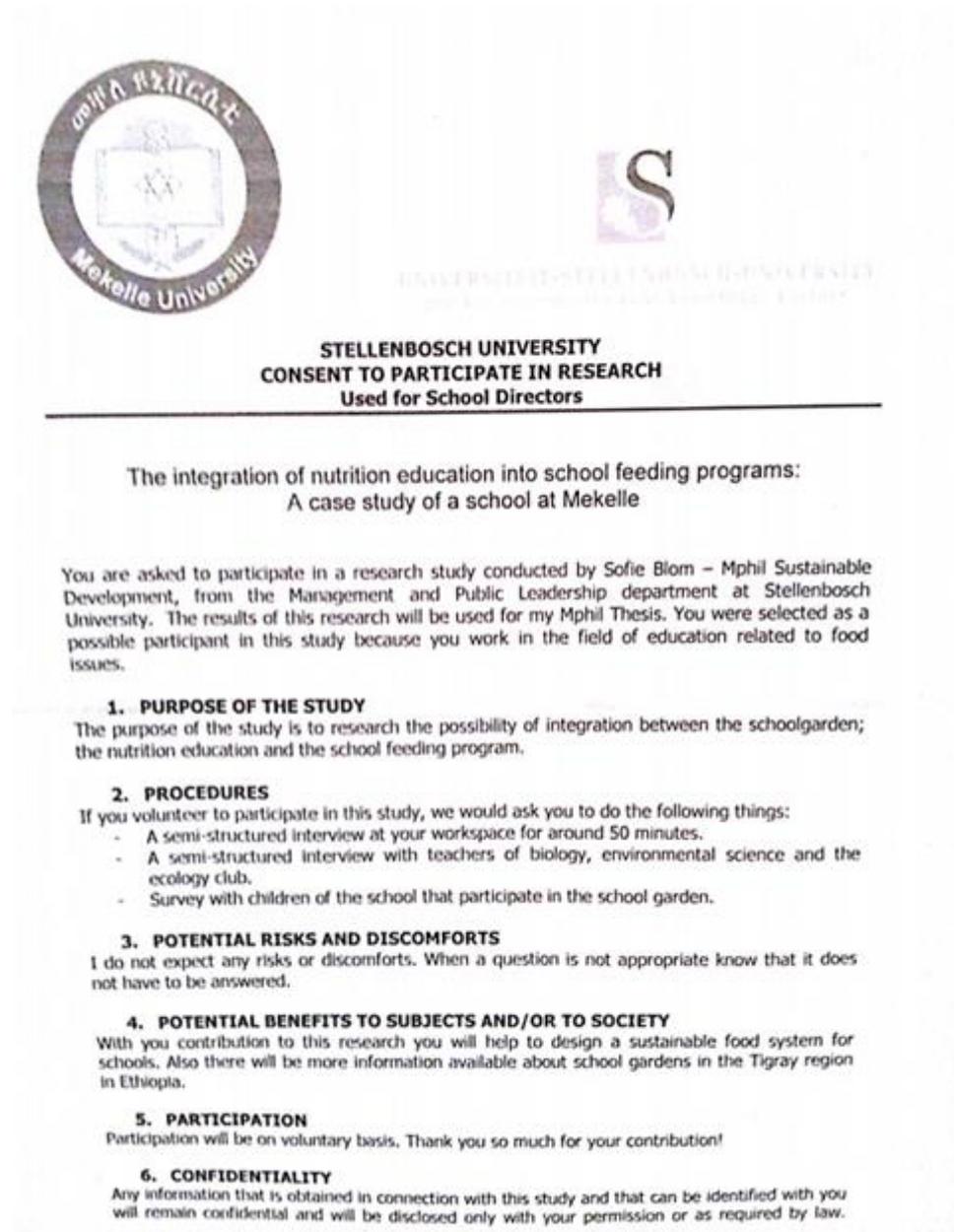
Regards,



ዳ/ር መንግስቱ ሃይሉ
ፕሮፌሰር ሳይንስ ተቋም ዳይሬክተር
Mengistu Hailu (Ed.D)
Director, Institute of
Pedagogical Science



Appendix B: Permission of Nicolas Memorial School and Qihen Primary School



Confidentiality will be maintained by means the information will be saved on my personal laptop which I will always keep in a safe place which is not accessible for other persons.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact
Sofie Blom: 0912655468
Dr. Mengistu Hailu: 0922787481
Pedagogic Department Mekelle University and co-supervisor of this project

9. RIGHTS OF RESEARCH SUBJECTS

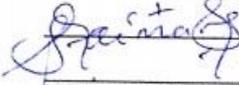
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to me by Sofie Blom in English and the participant is in command of this language or it was satisfactorily translated to him/her. The participant was given the opportunity to ask questions and these questions were answered to his/her satisfaction.

I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

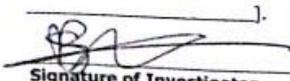
Tesfahunegn Hailemariam.
Name of Subject/Participant


Signature of Subject/Participant

21 August 2013
Date

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ (name of the participant). He/she was encouraged and given ample time to ask me any questions. This conversation was conducted in English and this conversation was translated into _____ by _____.


Signature of Investigator

21/08/2013
Date



**STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH
Used for School Directors**

**The integration of nutrition education into school feeding programs:
A case study of a school at Mekelle**

You are asked to participate in a research study conducted by Sofie Blom – Mphil Sustainable Development, from the Management and Public Leadership department at Stellenbosch University. The results of this research will be used for my Mphil Thesis. You were selected as a possible participant in this study because you work in the field of education related to food issues.

1. PURPOSE OF THE STUDY

The purpose of the study is to research the possibility of integration between the schoolgarden; the nutrition education and the school feeding program.

2. PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

- A semi-structured interview at your workspace for around 50 minutes.
- A semi-structured interview with teachers of biology, environmental science and the ecology club.
- Survey with children of the school that participate in the school garden.

3. POTENTIAL RISKS AND DISCOMFORTS

I do not expect any risks or discomforts. When a question is not appropriate know that it does not have to be answered.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

With your contribution to this research you will help to design a sustainable food system for schools. Also there will be more information available about school gardens in the Tigray region in Ethiopia.

5. PARTICIPATION

Participation will be on voluntary basis. Thank you so much for your contribution!

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact
Sofie Blom: 0912655468
Dr. Mengistu Hailu: 0922787481
Pedagogic Department Mekelle University and co-supervisor of this project

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouché@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to me by Sofie Blom in English and the participant is in command of this language or it was satisfactorily translated to him/her. The participant was given the opportunity to ask questions and these questions were answered to his/her satisfaction.

I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

Name of Subject/Participant

TEKLE MIKIALE

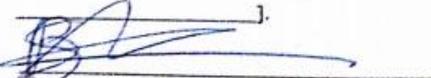
Signature of Subject/Participant



20/5/13
Date

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ (name of the participant). He/she was encouraged and given ample time to ask me any questions. This conversation was conducted in English and this conversation was translated into _____ by _____.


Signature of Investigator

21/05/2013
Date

Appendix C: Overview of interviewed officials of the Tigray Bureau of Education and NGOs

Interviews with actors around the school: NGO's and the Bureau of Education of Tigray and Kilte Awalo

Date	Organisation	Activity/Interview	Participant	Time
08 March	Tigray Bureau of Education	Interview with project coordinator school feeding	A. Mohamed Dawad	30 minutes
14 March	Tigray Bureau of Education	Interview with project coordinator school feeding	A. Mohamed Dawad	1 hour
01 April	Institute for Sustainable development	Meeting with coordinator Mekele	Mr Arefine	15 minutes
02 April	WFP	Coordinator WFP Tigray	A. Mesfin	1 hour
5 April 2013	Tigray Bureau of Education	Coordinator environmental education	T. Hadgu Meshesha,	2 hours
17 April	Bureau of Education Kilte Awalo	Principal of the bureau	Y. Kidan Amaria	1 hour
24 April	UNICEF	Coordinator environmental education	Mrs Ginet	45 minutes
10 May	Tigray Bureau of Education	Coordinator school feeding WFP	A. Mohamed Dawad	1 hour

13 May	WFP	Coordinator WFP Tigray	A. Mesfin	1 hour
20 May	Tigray Bureau of Education	Curriculum and implementation performer	A. Adane	45 minutes
21 May	Bureau of Education Kilte Awalo	Principal of the bureau	Y. Kidan Amaria	1 hour

Appendix D: Overview of the visited schools

School Visits April/May 2013

Date	Woreda (region) /Town/City	Name school	Address
17 April	Wokro (urban-small town)	1. Megabit 30	Wokro
		2. Selama school (visited 11 March)	Wokro
		3. Abre Atsbaha	Abra Atsbaha
18 April	Hintalo Wajirat (rural)	4. Waza Complete Elementary school	Waza
		5. Zwan Albe Elementary school	Iwane
		6. Iwane Primary school	Iwane
19 April	Mekele (urban)	7. Nicolas Memorial School	Behind regional president office- Abshunten, in front of Mercy school
23 April	Kilte Awalo (rural)	8. Qihen Primary School	Qihen. Between Mai Magden and Agula,

			10/15 min. on foot from the road
	Atsbi Umberta (rural)	9.Demaino Primary school	Demaino on the way from Agula to Atsbi
	Kilte Awalo (rural)	10.Birke Primary school	Birke, on the way from Agula to Atsbi
	Kilte Awalo (rural)	11.Agula Primary school	Agula on the road from Mekele to Wokro
30 April	Hintalo Wajirat (rural) *for this visits car required	12. Adi Awena	Left before Iwane
		13. Gemelo School – CHILD and LG school	Gemelo
20 May	Mekele (urban)	14.Sheba school	Mekele, kebele 18

Appendix E: Overview of interviews at Nicolas Memorial School

Date	School / Organisation	Activity – Interview	Time	Participant	Total time of visit
19 April	Nicolas Memorial School	Interview with the academic director as part of the visits to 14 schools in the region	15.00-16.30	Academic director T. Tamiru	1.5 hours
Week 1					
Friday 10	Nicolas	Meeting to	1 hour	With the	16.00 -

May	Memorial School	discuss and plan the interviews and activities		academic director T. Tamiru	17.00
Week 2					
Monday 13 May	Nicolas Memorial School				09.00 - 13.00
		Interview with the environmental and integrated science teacher	09.00-10.00	Environmental and integrated science teacher H. Gebrzigabiher	
		Observation of the feeding scheme	Morning bread 10.00-10.30		
		Interview with the principal	11.00-13.00	Principal Mr T. Hailemariam	
Wednesday 15 May	Nicolas Memorial School	An unexpected meeting of the teachers made it not possible to observe the garden work.	14.30	Environmental club leader and biology teacher Mr Mebratu-	
Thursday 16 May	Nicolas Memorial School	Interview with environmental science teacher	17.00 - 18.30	Mr H. Gebrzigabiher	17.00 - 18.30
Friday 17	Nicolas	Garden and	14.30 -	With Mr H.	14.30 -

May	Memorial School	ecology club observation	16.30	Gebrzigabiher	16.30
Week 3					
Wednesday 22 May					15.30- 16.30
	Observation of the art competition		15.30- 16.30	Art club	
Week 4					
Monday 27 May	Nicolas Memorial School	Interview with Principal	09.00- 10.00	Mr T. Hailemariam	09.00- 12.00
		Interview with biology teacher	10.30- 12.00	Mr Mebratu	

Appendix F: Overview of interviews at Qihen Primary School

Date	School / Organisation	Activity – Interview	Time	Participant	Total time of visit
23 April	Qihen Primary School	Interview with the principal; part of the visit to 14 schools in the region.	1.5 hours	Principal Mrs T. Mikaele	1.5 hours
Week 1					
Thursday 9 May	Qihen Primary School				From 07.45 till 13.30
		Interview with vice principal	07.45-08.45	Vice principal Mr T. Hailu	

		Explanation research	08.45-09.15	Mrs T. Mikaele	
		Walk in the village	09.45-10.30	Observation	
		Observation and interview preparation WFP feeding scheme	11.00-12.30	Cooks Mrs T. Hailu and A. Gebreslasye	
Week 2					
Tuesday 14 May	Qihen Primary School				From 10.00 till 15.00
		To set up meetings with the principal	10.00	Mrs T. Mikaele	
		Interview	12.30-13.15	Coordinator Environmental club F. Hafteaggu	
		Interview	13.15-13.30	Integrated science teacher	
		Interview	13.30-14.15	Biology teacher A. Asai	
Wednesday 15 May	Qihen Primary School				From 08.00 till 13.30
		Observation of the garden	08.15-08.45		
		Interview	09.00-09.30	Mr A. Hailu	
		Interview	09.30-10.15	Environmental science teacher A. Gebre	

		Observation WFP feeding scheme	12.15-12.45		
		Small talk with principal	13.00-13.30	Mrs T. Mikaele	
Week 3					
Tuesday 21 May	Qihen Primary School				09.00 – 15.00
		Interview at Tabia office	09.00-10.00	Mrs K. Mebrahtu	
		Meeting with the principal to give her coffee and sugar for her time	10.00-10.30	Mrs T. Mikaele	
		Meeting with community member/parent	11.00-13.00	Mrs F. Gimeskel	
	Bureau of Education Kilte Awalo	Interview about their policies and opinion of food in schools	14.00-15.00	Mr Y. Kidan	
Thursday 23 May	Qihen Primary school				08.00-13.00
		Interview with the principal	08.30-09.30	Mrs T. Mikaele	
		Presentation English	10.00-10.30	Grade 8	
		Interview with vice principal	12.00-13.00	Mr A. Hailu	

Week 4					
	Qihen Primary School				08.30-13.30
Tuesday 28 May		Interview with community member	09.00-10.00	Mrs S. Tadele	
		Interview with community member	10.30-12.00	S. Amhare	
		Feedback meeting with principal	12.30-13.00	Mrs T. Mikaele	
Week 5					
19 August	Qihen	Visits of parents to say goodbye and give the pictures and see Qihen in the rainy season			09.00 – 14.00
		House visit	09.00 – 10.00	Mrs S. Tadele	
		House visit	10.00-12.00	Mrs A. Gebreslasye	
		Observation of the village	12.00-13.00		
		House visit	13.00-14.00	Mrs F. Gimeskel	

Appendix G: Questionnaire used for 14 schools

Survey about the role of Food in schools with a school garden for the Principal or the teacher responsible for the garden.

For schools in the Tigray region with a school garden.

Name of participant in the survey:

Phone number:

Name of the school:

Place of the school:

Number of students:

School garden

What is the purpose of the garden?

When did the garden start?

Who got the idea to start a school garden?

Who financed the garden?

What grows in the garden?

What has the harvest been used for?

Who takes care of the garden?

In case it are the students; which grades work in the garden?

What do the students learn in the garden?

What are the challenges of the garden?

School feeding

Does your school have a school feeding program?

What do they eat?

When do they eat?

How many students participate in the school feeding programme?

Who is financing the programme?

Nutrition curricula

Do the students learn about nutrition?

As part of what course?

In which grades?

What do they learn about nutrition?

Integration about the 3 topics:

Is there a connection between the nutrition curricula and the school garden?

If answered yes: what is the connection?

Is there a connection between the school feeding programme and the school garden?

If answered yes: what is the connection?

Is there a connection between the nutrition curricula and the school feeding programme?

If answered yes: what is the connection?

Is there a connection between the three subjects?

If answered yes: what is the connection?

The survey was also available in Amharic.