

African Studies Centre

School farming and school
feeding in Nakuru town,
Kenya

Practice and potential

Dick Foeken, Samuel O. Owuor & Alice M. Mwangi

ASC Working Paper 76 / 2007

Dick W.J. Foeken (PhD)

African Studies Centre, Leiden, The Netherlands

dfoeken@ascleiden.nl

Samuel O. Owuor (PhD)

Department of Geography & Environmental Studies, University of Nairobi

samowuor@uonbi.ac.ke

Alice M. Mwangi (PhD)

Unit of Applied Nutrition, University of Nairobi

amwangi@uonbi.ac.ke

African Studies Centre

P.O. Box 9555

2300 RB Leiden

The Netherlands

Telephone +31-71-5273372

Fax +31-71-5273344

E-mail asc@ascleiden.nl

Website <http://www.ascleiden.nl>

Contents

List of tables	iv
Acknowledgements	v
1. INTRODUCTION	1
The issue	1
School farming and school feeding in Kenya: a brief overview	3
The research location: Nakuru town	5
Study objectives and research methods	6
The study population: the schools and some basic characteristics	6
2. SCHOOL FARMING IN NAKURU TOWN	8
Engagement in farming activities	8
Crop cultivation	9
Livestock keeping	18
Tree growing and flower gardening	22
3. SCHOOL FEEDING IN NAKURU TOWN	27
School feeding programmes	27
School feeding in relation with school farming	29
School feeding and nutrition	32
4. CONCLUSIONS	35
The <i>Gardens for Life</i> project in Kenya	35
The current practice in Nakuru Municipality	36
The potential in Nakuru Municipality	38
Annexes	40
1. Additional tables	40
2. Anthropometrical data collection and analysis	42
References	45

List of tables

1	Engagement in farming activities by school category	8
2	Main reasons to start crop cultivation by school category	10
3	Most important crops cultivated by schools in 2006 by school category	12
4	Material inputs used for crop cultivation by school category	13
5	Crop harvests and land productivity	15
6	Use of crops by school category	15
7	Constraints with crop cultivation by school category	16
8	Most frequently mentioned benefits of crop cultivation, as perceived by the respondents, by school category	17
9	Reasons for not keeping livestock by school category	18
10	Tree growing: reasons to start and present objectives	22
11	Types of tree growing by school category	23
12	Involvement in tree growing activities by school category	24
13	Reasons to start a school feeding programme by school category	27
14	Eligibility for school feeding programme by type of school population	28
15	Types of dishes served at lunch by school category	29
16	Relationship between crop cultivation and school feeding by school category	30
17	Major self-produced crops used for school feeding programme by school category	31
18	Average lengths of period (in months) of use of self-produced ingredients for lunch and morning break, by school category	31
19	Percentages of class 1 children being wasted, stunted and underweight, by sex	32
20	Relationship between school feeding and nutrition (primary schools)	33
A1	Crops cultivated in 2006 by school category	40
A2	Crop harvests in 2006 by school category (kgs)	40
A3	Crops used for school feeding programme	41
A4	Major crops used for lunch by length of period in months	41
A5	Relationship between school feeding and nutrition (primary schools)	44

Acknowledgements

The first idea to do a study on school farming in Nakuru arose in the course of the 1990s and developed into a Masters project in the context of the Nakuru Urban Agriculture Project (NUAP, Phase 1), carried out by Correta Odera. The results of her study – especially the fact that farming by schools in Nakuru appeared to be very common – led to the wish to do a much more thorough study on the topic, with a particular focus on the relationship between school farming and school feeding. During initial meetings with several officials in the municipality this idea was enthusiastically welcomed, so a research proposal was developed.

On May 31st, 2005, this proposal was thoroughly discussed with a group of local stakeholders. The objectives of this meeting were (a) to get input from them into the research proposal, (b) to hear the opinions (both personal and institutional) about the proposal and the study itself, (c) to identify possible inputs from local stakeholders during the study, (d) to hear the stakeholders' ideas about implementation of the results, and (e) to identify one or more local partners/users in/of the study. Besides the three main researchers, the following persons participated in this meeting: Mr. Samwell Githaiga (Head teacher, Crater Primary School), Mr. Michael Kamau (Agriculture teacher, City Mission Secondary School), Mr. Pius Munialo (Inspector of Schools, Municipal Education Office), Mr. Joseph Ngugi (Head teacher, Rhino Primary School), Mr. John Njenga (Programme Officer, SENVINET), Mr. Reuben A. Oduor (Head teacher, City Mission Secondary School), Ms. Anastasia M. Ongoma (Divisional Agricultural Extension Officer (Municipality of Nakuru), Ministry of Agriculture), Mr. Charles Osii (Agricultural teacher, Nakuru Blanket Secondary School), Mr. John Waithaka (Divisional Agricultural Extension Officer (Municipality of Nakuru), Ministry of Agriculture), and Mr. William Wanyonyi (Assistant Director of Environment, Municipal Council of Nakuru). We want to thank them all for their input.

Our gratitude also goes to Wijnand Klaver (African Studies Centre) for his very useful input during the stages of the formulation of the research proposal and the development of the questionnaire for the first fieldwork phase. This fieldwork consisted of a general survey among all primary and secondary schools in Nakuru and took place in June 2006. We want to thank the field assistants who visited the schools with a long questionnaire: Teresia Achieng', Beatrice Adhiambo, Evans Ihaji, Simon Kiarie, Albert Mobegi, Wycliff Oduo, Monica Okwiry, Aloys Ombasa, Isaiah Sakwa, Purity Wambui, Josephine Wanjiku, and Margaret Wanjiru. Obviously, we are very grateful to the respondents at the schools who were so willing to answer all our questions. The present report is the result of this survey.

1 Introduction

The issue

During the past two decades there has been increasing attention among both researchers and policy-makers for urban agriculture, a phenomenon that has shown an enormous increase in sub-Saharan Africa during that period. The increase in urban agriculture is generally considered as a response to the decreased purchasing power (price rises, stagnating salaries, increased unemployment, etc.) of large segments of the urban population that has prevailed in many African countries since the beginning of the 1980s. Although largely an informal economic activity, urban agriculture plays a potentially beneficial role in terms of the urban food supply, urban economy and urban development in general (Smit *et al.* 1996).

Studies on urban agriculture across Africa have shown that most townspeople who farm do so in order to improve their food situation and are doing it mostly for self-consumption (see Obudho & Foeken 1999; for a brief overview of the results of these studies, see Foeken & Owuor 2002; on Nakuru, see Foeken 2006). In addition, urban agriculture provides employment as well as an income for those involved. This income can be direct through sales of crops and livestock products or indirect since less food has to be purchased ('fungible income'). More recently, urban agriculture is seen not only as a means to increase the (poor) urban households' level of food security but also in relation to a better urban environment (recycling of organic waste, green zones, etc.) and, hence, to sustainable urban development.

So far, almost all research regarding urban agriculture in sub-Saharan Africa – and indeed, practically in the whole world – has concentrated on farming by individual urban households. Furthermore, serious attempts have been made to put the topic of urban agriculture on the policy agenda (and with some success) through for instance various international workshops and a comprehensive reader (Bakker *et al.* 2000). Despite being a commonly observed phenomenon in many African towns and cities, farming by urban institutions has been largely overlooked (or at least has not received attention) by both researchers and policy makers. This study is an attempt to fill this gap.

Besides state farms located within the boundaries of urban centres, institutions that practice agriculture in town include monasteries and convents, factories, prisons, schools, hospitals and the army. For instance, a large factory in Morogoro, Tanzania (Tanzania Tobacco Processors Limited) exploits vegetable and fruit fields, partly for consumption in the firm's canteen and partly for selling to individual buyers.¹ In Kenya, a broad range of crops is cultivated and various livestock kept on the Nakuru Prison's 1000 acre farm

¹ Personal communication at the site, 1999.

located within the municipality. The produce from the farm is sold to the prison and the prison staff (both at reduced rates) and to outsiders (at commercial rates).²

Probably the most prevalent and important type of institutional urban agriculture is school farming – the focus of the present study. In potential, farming by schools can benefit the pupils' food intake, particularly when the produce of school farming activities is used for school feeding programmes. A related potential benefit of school farming is the creation of nutritional and environmental awareness among the pupils, notably by practicing organic farming.

Besides a study carried out in the city of Cagayan de Oro in the Philippines (Potutan *et al.* 1999) and a preliminary study in Nakuru, Kenya (Odera forthcoming), there is hardly any systematic study and published literature on this subject. Based on a broader aerial survey carried out in 1999, Dongus (2000) observed that 33 schools in Dar es Salaam were engaged in vegetable production. Of these, 30 were primary schools and the other three secondary schools. The majority of the schools (23) practiced rain-fed farming, the others irrigated their crops. A total of 62 acres were under cultivation, i.e. on average 1.9 acres per school. Comparing these data with those from aerial maps of 1992 showed that six of the 33 schools did not grow vegetables in 1992, but started doing so afterwards. However, another 16 schools stopped cultivating between 1992 and 1999, for various reasons: shortage of rains, new school buildings, planting of trees and/or flowers, or a combination of these.

In their in-depth study of school farming in Cagayan de Oro, Potutan *et al.* (1999) found that nearly all public primary schools in the city have gardens, which are tilled by the pupils (assisted by their mothers) under the supervision of teachers. According to the study school farming was beneficial in various ways, contributing to the children's households' economy and food security, the production of cheap and nutritious food, the consumption of healthy food, the urban environment, and communalism and co-operation in the local community.

As said above, farming by schools can be even more important to the pupils' food intake, particularly when the produce of the school farming activities is used for school feeding programmes. Vast numbers of school-aged children in developing countries face major health and nutrition problems that adversely affect their ability to take advantage of the limited educational opportunities available to them. Many of these children have a history of protein-energy-malnutrition (PEM) as well as other nutritional deficiencies affecting their nutritional condition. School feeding is part of a package of interventions which has been used to alleviate PEM as well as short-term hunger amongst school going children (Levinger 1996).

Studies conducted on the impact of school feeding programmes on the physical (and mental) condition of children have shown positive and encouraging results. This is by no means a recent phenomenon. For example, in Baroda, India, the nutritional condition of children improved significantly after the introduction of a school feeding programme at lunch time (Rajalakshmi 1967). Similar findings were recorded in Mafraq, Jordan (Hijazi

² Personal communication with the farm manager, 2000.

& Abdulatif 1986) and in the Philippines where Lavinger (1986) observed that children with a good nutritional status performed better in school than children with a poor nutritional condition. Similarly, Pollitt (1990) cited other studies (e.g. Wilson 1981; Moock & Leslie 1986; and Simeon & Grantham-McGregor 1989) that found a positive relationship between the nutritional condition of children, on the one hand, and school performance, on the other.

School farming and school feeding in Kenya: a brief overview

School farming

School farming is not new in Kenya, particularly in the rural areas where it dates back to the colonial period. Farming, especially in the rural primary schools, was promoted by the government through the so-called 4-K clubs, an acronym for *Kuungana, Kufanya na Kusaidia Kenya*, which means “get together, act and help Kenya”. The major goals of the programme were: (1) to teach the youth improved methods of agriculture; (2) to teach the youth to appreciate agriculture and the dignity of labour with respect for agriculture as a profession; (3) to help the youth produce food for their families and to sell; (4) to develop leadership skills among the youth and adults through voluntary participation in agricultural programmes; and (5) to change adult farmers’ attitudes and practices (Odera forthcoming).

Farming in urban schools started mainly as something of an aesthetic nature, namely with planting flowers and trees. There was no need to grow food because the government subsidised school feeding programmes (since 1970) for which the pupils needed to pay very little. But early 1978 the government’s food subsidies stopped, so schools started to feel the need to grow food crops instead of flowers and trees. However, some schools had started to grow crops earlier already. In Nakuru, the first school was Bahati Secondary School, which started to farm in 1970 (Mwago 2000).

Although not compulsory, agriculture is also taught as an examinable subject in many secondary schools in Kenya. For those schools and students who choose to do agriculture, farming is mandatory for examination purposes with a theory and a practical paper. In primary schools, agriculture was introduced in the curriculum in 1986 with the introduction of the new 8-4-4 system of education and was taught and examined together with science. As such all primary schools taught agriculture. Though not necessarily examined, it was a common practice for all primary schools in rural and urban areas to have a school *shamba* (garden) where the pupils, particularly those in upper primary, acquired practical skills and knowledge in farming. In 2000, however, the government decided to exclude agriculture as an examinable subject in primary schools.

Most boarding schools with enough land are also known to practice farming as a way of producing their own food. Crop production (mainly for maize and beans) and livestock keeping (mainly for milk) is carried out by the school administration to reduce the cost of buying food for the students. More recently, this practice has become one of the ways schools respond to increases in food prices, reduced government subsidies while at the same time maintaining affordable school fees for parents.

Today, depending on the reason(s), farming activities – including tree planting and flower gardening – in schools are carried out by clubs (4-K clubs, young farmers clubs, environmental clubs), the agriculture class or the school itself. The clubs and their activities are supervised by a teacher who also acts as patron of the club. Club activities are basically extra-curriculum activities with varied aims and membership. In schools with an agriculture class, farming is determined by the syllabus and is a practical session of what has been taught in class. Each student has his/her individual plot and the crops they grow are assessed for examination purposes (Odera forthcoming).

The decision on how the produce is used depends on the way the farming is organised, on the type of school, and on the persons in charge of the school. Pupils organised in 4-K clubs have a say in the use of the produce. Crops may be sold or taken home for consumption. In boarding schools, the produce is often used for preparing meals in school. In schools with a large piece of land, the administration is more likely to have a say in the destination of the crop because quite some money may be involved (Mwago 2000).

School feeding

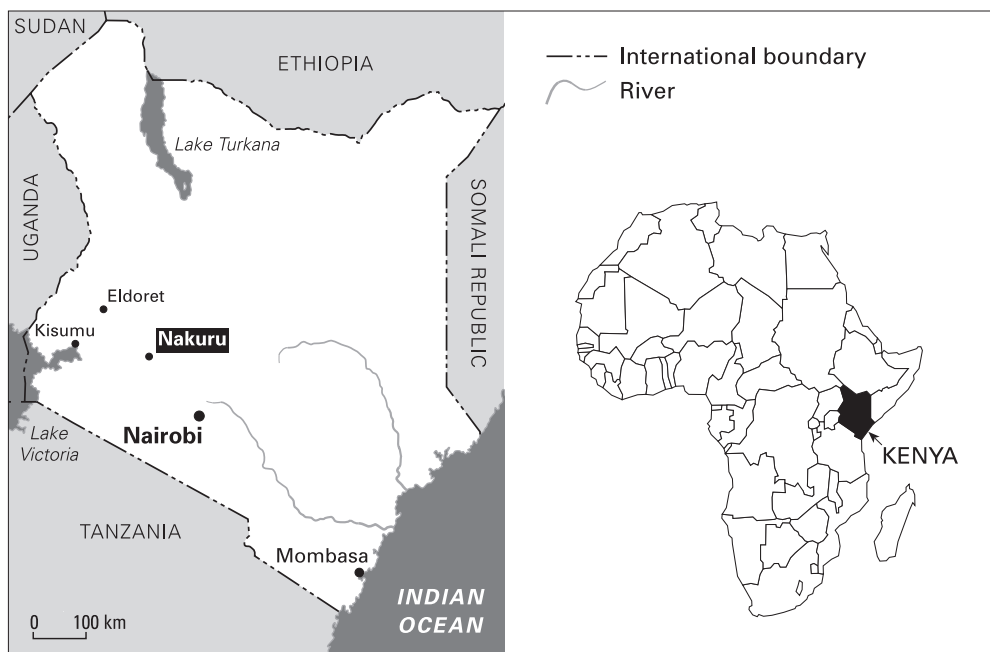
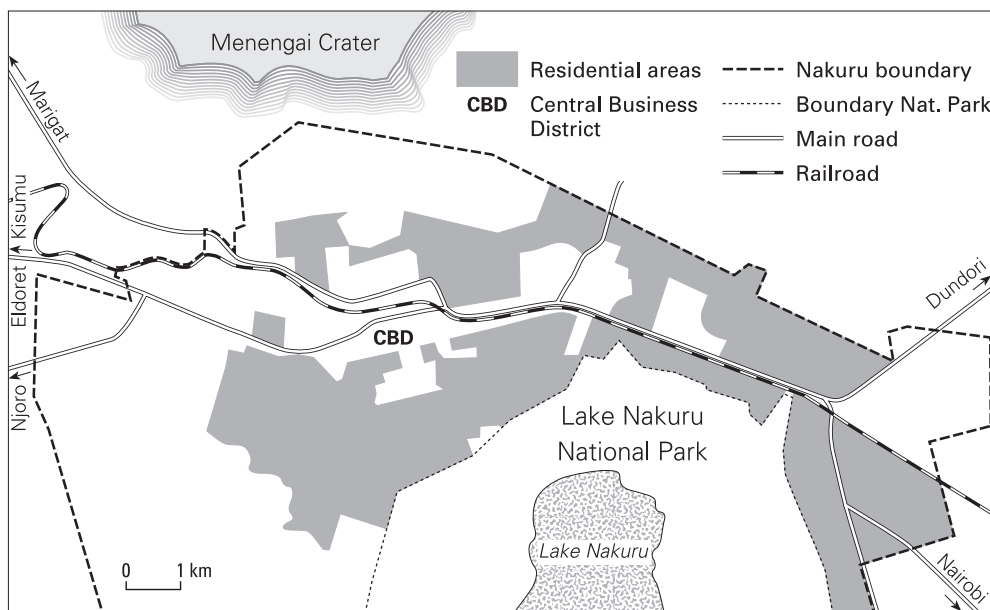
School feeding programmes were launched in Kenya in 1967 under the National School Feeding Council of Kenya (NSFCK). By 1986 it had reached its peak, covering 60,000 pre-primary and primary school children in 15 districts. Mainly due to financial constraints, the programme had to reduce its activities and by 1996 only 13,000 children were reached in four districts. Two studies, one in Kirinyaga District (Pieters *et al.* 1977) and one in Nyambene District (Meme 1996; Meme *et al.* 1998), showed that children participating in the NSFCK programme were better off in terms of nutritional status and school performance than children not participating in the programme.

Providing a child with a single, daily nutritious meal at school is also seen as a simple and effective way to attract children to school and to improve school attendance and retention rates. This conviction forms the background of the global school feeding programme of the World Food Programme (WFP), which, in 2001, reached more than 15 million children in schools in 57 countries (see WFP 2002). One of these countries is Kenya where, by the end of 2001, 1.3 million children received a daily meal in 4,700 schools, mostly in more peripheral and/or poor rural areas. For instance, in Turkana District, the attendance of girls had increased by 130% within one year after the introduction of the WFP programme.

An important recent development in Kenya was the political transition after the elections of end 2002. The provision of free primary education was among key policy changes that the present government implemented immediately it assumed power in January 2003. There is now a massive influx of schoolchildren. Some of them are complete beginners; others are able to pick up where they left off before poverty forced them out of school (VOA News 2003). Hence, the immediate effect of the measure is an increase of the *enrolment* rates at primary schools. It may, for the time being, also have a positive effect on the *attendance* rate of the children, but it is doubtful whether this effect will be long-lasting.

The research location: Nakuru town

Nakuru is located in the heart of the Great East African Rift Valley, 160 km northwest of Nairobi. Nakuru came into existence in 1904 as a railway station on the East African Railway (or Uganda Railway) and soon developed into an important regional trading and market centre. The total area of the municipality is about 300 square kilometres, of which 40 square kilometres is covered by Lake Nakuru (MCN 1999). With an average annual rainfall of about 950 mm, Nakuru has a dry sub-humid equatorial climate. There are two rainy seasons: the long rains during March-May and the short rains during October-December.



Over the past 30 years, the population of Nakuru town has increased fivefold from 47,000 in 1969 (Kenya 1970) to 239,000 in 1999 (Kenya 2000). At present, Nakuru is the fourth largest town in Kenya after Nairobi, Mombasa and Kisumu. The average annual growth rate between the censuses of 1989 and 1999 was 4.3%, which was much lower than the figure of 6.5 from the previous decade. In 1997, the prevalence of absolute poverty in Nakuru town was 41% compared to about 30% in 1994 (Kenya 2001).

Nakuru's location along the Kenya-Uganda Railway and the Trans African Highway, linking the coastal region, Nairobi and the western parts of Kenya, has played an important role in its growth. The important economic sectors of Nakuru are commerce, industry, tourism, agriculture and tertiary services (MCN 1999). Besides these economic activities, Nakuru town is an important transport and administrative centre. The town also serves as a centre for agro-based industrial and manufacturing activities for its immediate rich agricultural hinterland.

Study objectives and research methods

The main objectives of the whole study are: 1) to describe the practice of school farming and school feeding in Nakuru town; 2) to assess the awareness concerning environmentally-friendly farming; 3) to establish the contribution of school farming to school feeding programmes; 4) to determine to what extent the pupils (or students) benefit from school farming and school feeding programmes in terms of food consumption, dietary recalls and attendance; and 5) to assess the potential for school farming in combination with school feeding in Nakuru town. As part of the *Nakuru Urban Agriculture (Research) Project* (NUAP), this study is a detailed follow-up of a preliminary study undertaken in the same town between 2000 and 2001 (see Odera forthcoming).

The present report deals largely with the first objective. The findings are based on a general survey among the primary and secondary schools within Nakuru Municipality that took place in June 2006. Of the 123 primary and secondary schools in Nakuru at the time of the survey, 116 were covered. A largely-structured questionnaire was used containing questions about school characteristics, school farming activities (crop cultivation, livestock keeping, tree growing and flower gardening) and school feeding practices. Moreover, anthropometrical data (height, weight, age) were gathered for all class 1 primary school pupils or, in case of more than one stream of class 1, one of the streams was randomly selected.

The study population: the schools and some basic characteristics

In 2006, there were 123 primary and secondary schools in Nakuru town; 116 of these were visited with a general questionnaire. A distinction of these schools can be made in terms of their category (primary, secondary), type (day, boarding), management (government,³ private) and kind (normal, special). More than half (61%) were primary schools, 36% were secondary schools, while three schools had both a primary and a secondary

³ Also known as public schools.

section. Not unexpected of a town, most of the schools were day schools (74%) or a mixture of day and boarding (16%). The remaining 11 schools were boarding schools, eight of them in the secondary category.

In terms of management, three-fifths of the schools were government schools, while the rest were run privately by individuals or churches. However, the proportion of government schools was higher in primary than in secondary schools (73% vs. 41%). There were five schools – all of them public primary – catering for pupils with special needs (mainly deaf and pupils with mental disability).

Whereas the number of primary and secondary schools has been increasing over the years, the period between 2000 and 2006 has witnessed the highest increase of schools in Nakuru town,⁴ a large majority of them being new private schools. Before this period, the government has been the main player in the provision of primary and secondary education facilities to the residents of Nakuru town. This is not surprising because it is the duty of the government and the municipality to provide public primary schools to cater for children from the neighbourhood and neighbouring estates. Public secondary schools have a much wider catchment area, either at the town, district or national level. Following the introduction of free primary school education, the number of pupils attending school has increased tremendously, especially in the lower classes. At the time of the survey, there were 14 primary schools with more than 1000 pupils – an average of 125 pupils per class.

⁴ More than 40 schools started since the year 2000, which means that in 2006 there were about 50% more schools than in 2000.

2 School farming in Nakuru town

Engagement in farming activities

During the survey, questions were asked about crop cultivation, livestock keeping, tree growing and flower gardening in schools. This study argues that agriculture extends beyond the traditional narrow view of crop cultivation and livestock keeping.⁵ Tree planting and flower gardening have often been neglected in studies concerning farming – yet these activities, and especially tree planting, may be undertaken in relation to or together with farming. Table 1 shows the numbers and percentages of schools in Nakuru town engaged in crop cultivation, livestock keeping, tree growing and flower gardening activities.

The table shows first of all that schools in Nakuru town preferred crop cultivation to livestock keeping. Slightly more than half of the schools (56%) engaged in crop cultivation compared to 18 schools (16%) which engaged in livestock keeping. Furthermore, both crop cultivation and livestock keeping was much more common among secondary schools than among primary schools. Except for two, all the schools which kept animals combined it with crop cultivation. The popularity of crops over livestock may partly be explained by the fact that growing crops is not only cheaper but also easier than livestock keeping, for instance in terms of feeding, disease management and day-to-day care. In addition, the school curriculum lays more emphasis on crop cultivation than on rearing animals when assessing students in the agriculture practical paper.

Table 1 Engagement in farming activities by school category (%)⁶

	All schools (N=116)		Primary schools (N=71)		Secondary schools (N=42)	
	Abs.	%	Abs.	%	Abs.	%
Crop cultivation	65	56	32	45	31	74
Livestock keeping	18	16	7	10	9	21
Tree growing	105	91	66	93	36	86
Flower gardening	113	97	70	99	40	95

Source: School survey 2006.

⁵ According to Wikipedia, agriculture (a term which encompasses farming) is the process of producing food, feed, fiber and other goods by the systematic raising of plants and animals (see <http://en.wikipedia.org/wiki/Agriculture>, accessed on 5 June 2007).

⁶ In this and all following tables, the three schools with both a primary and secondary section are included in the 'all schools' column, but excluded from the 'primary schools' and 'secondary schools' columns.

Almost all schools engaged in tree growing and flower gardening. The prevalence of tree planting activities in most of the schools is closely linked to the wind and dust which is common in the town due to its location on the floor of the Rift Valley with its volcanic soils. In fact, the Maasai named the place *Nakurro* meaning a “place of winds” or a “dusty place”. It is because of this that schools plant trees to contain the winds and its effects. Flower gardening is more often than not an activity to make the school beautiful.

An important player in the field of school farming in Nakuru is a local NGO called SENVINET (Schools Environmental Network). Its main objective is to work for a sustainable environment and control and management of HIV/Aids. It is targeting children and youth, seen as agents of change in the society. Therefore, members of SENVINET are mainly schools in Nakuru municipality. In those schools, SENVINET tries to establish environmental awareness among the pupils by promoting – and assisting with – organic farming, tree growing and flower gardening.⁷ Almost half (45%) of the schools in Nakuru were a member of SENVINET at the time of the survey, the large majority of these (88%) being primary schools. The most common activities the 52 member schools were engaged in were tree growing (92%), flower gardening (87%), garbage management (65%), grass planting (44%) and organic farming (15%); i.e. an average of three types of activities per school.⁸

Crop cultivation

While crop cultivation is an established practice in some schools, it is also a new phenomenon in others. Twelve schools started growing crops before 1990, nine of them being secondary schools. However, the school with the longest crop cultivation history is a primary school (Lanet Primary School), which started with this activity around 1970. The majority of both primary (69%) and secondary (55%) schools started crop cultivation after 2000. As much as this partly attributed to the increase in the number of schools during that period, other factors may come into play.

By and large, crop cultivation is an annual activity for all the secondary schools and a large majority (81%) of the primary schools that practice it. Six primary schools had at one time been forced not to cultivate for a year or two either because of drought, lack of seeds, destruction of crops by baboons or utilization of the school *shamba* for building more classrooms.

Table 1 also shows that slightly less than half of the Nakuru schools did *not* cultivate crops. Most of them were primary schools. A variety of reasons were given (by the respondents of these 39 primary schools) for not practicing crop cultivation. The most important ones were ‘not enough land’, ‘lack of capital’ and ‘loss of crops’ (due to theft or animals). Interestingly, 12 of these primary schools had practiced crop cultivation in the past, growing such crops as maize, kale and beans. The most important reason to stop

⁷ See <http://www.senvinet.net>

⁸ In four schools (8%), HIV/Aids awareness was mentioned and in two schools (4%) environmental conservation.

with the activity was a lack of funds to pay the workers.⁹ As for the eleven secondary schools *not* practicing crop cultivation, all of them mentioned a lack of sufficient land for not doing so. For two schools, another reason was that agriculture was not a subject, while one school also lacked sufficient funds (besides the lack of land). None of these eleven schools had practiced crop cultivation in the past.

Reasons to start crop cultivation

Various reasons were mentioned as the motivation to start crop cultivation. Three of them stand out as the main ones among schools in Nakuru town (see Table 2). First, for half of the schools, the activity was started as a requirement in the school curriculum for learning and teaching agriculture as an examinable subject. This requirement is bound to affect the secondary schools more than their primary counterparts. Agriculture has been taught in secondary schools for a long time but only introduced in primary schools in 1986 and later scrapped in 2000. It is for this reason that over three-quarters of the secondary schools started growing crops for learning and teaching purposes compared to a quarter of the primary schools.

Table 2 Main reasons to start crop cultivation by school category (%)

	All schools (N=65)	Primary schools (N=32)	Secondary schools (N=31)
For learning and teaching purposes	52	28	78
To help in school feeding programme	49	50	48
To utilize the existing land	19	22	13

Source: School survey 2006.

Second, about half of both primary and secondary schools started to grow crops as a way of producing food that can be used in their school feeding programmes – be it for the lunch programmes in day schools or for the daily meals in boarding schools. Lastly, about one fifth of the schools saw crop cultivation as an opportunity of utilizing the existing school land in a beneficial way, i.e. rather than leaving the undeveloped land idle.

There are other reasons mentioned by less than 10% of the schools in each category, but which are equally important to take note of. Notably, five schools started to grow crops as a way of generating additional income to the school. Another observation is that some primary schools started the activity as a source of income to the participating pupils, as a source of food to support needy pupils (i.e. the poor and orphans) with lunch, and as a source of lunch for the teachers who come from far.

⁹ Other reasons, mentioned by only a few schools, were ‘not enough land’ (3 schools), ‘crops destroyed by livestock’ (3), ‘increased theft cases’ (2), ‘poor weather conditions’ (2), ‘teacher in charge transferred’ (1) and ‘tribal clashes’ (1).

Plots

The large majority of the schools (94%) had the *shamba*¹⁰ in the school compound. Two schools (both secondary) had plots both inside and outside the compound, while two other ones (one primary and one secondary) only had a plot outside. All of these outside plots except one were located at a short distance from the school. The one exception is Paramount Academy, a small private primary day school in Langalanga estate:

The school has access to a plot of 6.25 acres in the Lanet area, about 10 km to the east, on the fringes of the municipality. Maize, beans, peas and potatoes are cultivated there. The production process is rather sophisticated, for instance the use of a tractor, various kinds of material inputs (both organic and chemical) and sprinkle irrigation. The school employs labourers to do the work. A 'normal' harvest consists of 25-30 (90-kg) bags of maize, 10-12 (90-kg) bags of beans, two (50-kg) bags of peas and four (90-kg) bags of potatoes. The produce is partly used for the school feeding programme and partly sold.

Plot sizes in the school compounds vary considerably. The smallest *shambas* measured less than 0.1 acres, the biggest ones 5 acres. One school, Moi Forces Academy (secondary/boarding), stood out with a plot of no less than 45 acres (out of a total school area of 195 acres), located in the eastern part of the municipality. Substantial produces of maize, beans, kale, cabbage as well as milk (from the 25 cows) were realised, all being used in the school's feeding programme for the more than 700 students and school staff.

Shambas in primary school compounds were generally somewhat bigger than in secondary school compounds. For instance, half of the primary school *shambas* were smaller than one acre, against 62% of the secondary school plots. This may be attributed to school management, i.e. government schools are bound to have more space than private- or church-run schools, which will tend to maximize on their use of space for building purposes. As seen above, the proportion of government schools was higher in primary than in secondary schools.

Organisation

Generally, the teachers, pupils (be it as an individual, a class or a club) and school workers were involved in crop cultivation activities in one way or the other. The degree of involvement depends on the reason for cultivation and the role each actor plays in the cultivation process. For example, teachers played a more supervisory role while working with the pupils, a class, a club or school workers. The agricultural class is bound to be more involved in the process of growing crops for examination purposes.

In three-quarters of the crop-cultivating *secondary schools*, the Agriculture class¹¹ was responsible for the activity and carried out most of the work, i.e. land preparation, planting, weeding, watering and harvesting. Both teachers and school workers were involved

¹⁰ *Shamba* is the Swahili word for plot or field.

¹¹ The Agriculture class constitutes of those students who choose to do agriculture as an examinable subject. For this class, farming is part of their practical examination. It is also important to note that agriculture is not a compulsory subject in secondary schools and therefore it is not mandatory that all schools teach and examine it. As such, only schools offering it as an examinable subject may have an Agriculture class.

in these activities in about a third of the secondary schools. In some schools, the Young Farmers Club¹² took part in the work, while five schools hired additional labour.

In most of the *primary schools* (81%), the school itself was responsible for crop cultivation. However, most of the work was divided among teachers, school workers and to a lesser extent hired labour. In about a fifth of the primary schools, ‘all pupils’ (i.e. regardless in which class they are) were involved in the various activities. In other schools, some pupils were members of various clubs that did (part of) the work. Examples were the Young Farmers Club (2 schools), the 4-K Club (2), the Environmental Club (2), the Girl Guides (2) and the SENVINET Club (1).

Crops cultivated

Schools in Nakuru town cultivated a variety of crops. In 2006, sixteen different crops were cultivated (see Table A1 in Annex 1). The most popular crops in terms of the number of schools growing them were kale (*sukuma wiki*¹³), beans, maize, cabbage, spinach and potatoes (Table 3). There were marked differences between primary and secondary schools regarding the choice of crops. For instance, *sukuma wiki* and maize were (much) more commonly grown in primary schools than in secondary schools, but for beans and cabbage it was the other way around. Cowpeas were cultivated by 16% of the primary schools but none of the secondary schools (Table A1). With adequate rainfall, *sukuma wiki* and maize are “easier to grow” in terms of the care needed and can be “grown anywhere in Nakuru”. As a common dish in most households in Kenya, these crops are also a relatively cheap alternative for lunch feeding programmes, especially in primary schools. Beans, cabbages and cowpeas, if not well taken care of, are prone to a variety of pests and diseases. Many primary schools cannot afford to pay for this extra labour and care.

Table 3 Most important crops cultivated by schools in 2006 by school category (%)

Crop type	All schools (N=65)	Primary schools (N=32)	Secondary schools (N=31)
Kale (<i>sukuma wiki</i>)	60	72	48
Beans	48	41	58
Maize	45	56	36
Cabbage	31	16	45
Spinach	17	16	16
Potatoes	15	13	19

Source: School survey 2006.

¹² Young Farmers Club is a group of pupils or students (at any level in school) with a common interest in farming – hence the name “young farmers”. Under their patron, they involve themselves in various farming and related activities.

¹³ *Sukuma wiki* is the local name for a green, leafy vegetable of the spinach variety (*Spinacea oleracea*) and also called kale, literally meaning “to push the week”. This refers to the importance of the crop for subsistence dwellers in their daily diet due to its high yield and low price.

Inputs

As far as inputs are concerned, the survey focused on tools and material inputs. The main crop cultivation activities in schools that require inputs are land preparation, planting, weeding, watering and harvesting. As far as tools are concerned, school farming in Nakuru town is generally practiced using simple hand tools. The most commonly used tools are the hand hoe (*jembe*) and the cutlass (*panga*). For some, a rake and a slasher become handy when needed. Whereas in general farming techniques for crop cultivation are simple, seven schools reported that they used tractors as well. Out of the seven, only one of them was a primary school – privately managed and with 6 acres under crops. The others were secondary schools, some of which are well established government schools, with relatively bigger plots and a long tradition of farming (e.g. Nakuru High School, Moi Forces Academy, Lanet Secondary School). Lastly, two schools – which kept live-stock as well – occasionally used an ox-plough.

In general, the use of material inputs among schools in Nakuru was quite common. All the schools used at least one type of input to enhance their production (see Table 4). This shows not only their awareness of the advantages of using inputs but also the seriousness with which the schools undertake farming. Notably is the schools' awareness in using organic fertilizers and improved seeds or seedlings. The very common use of environmentally friendly organic fertilizers can be explained by the strong presence (in schools) of SENVINET (Systems Environmental Network) and Environmental clubs, which advocate for organic farming in schools.

Table 4 Material inputs used for crop cultivation by school category (%)

Input	All schools (N=65)	Primary schools (N=32)	Secondary schools (N=31)
Organic fertilizer	75	81	74
Chemical fertilizer	51	28	74
Chemical pesticide	59	31	84
Chemical insecticides	55	34	74
Local seeds	40	56	23
Improved seeds	83	72	94
Irrigation	82	72	90

Source: School survey 2006.

When the two categories of schools are compared, one observes that particularly the use of chemical inputs was more prevalent among the secondary schools. About 75% of the secondary schools used chemical fertilizers, chemical pesticides or chemical insecticides. This may be due to economic considerations: secondary schools can more likely afford the purchased inputs than primary schools. Besides the economic constraints – organic fertilizer is a cheaper alternative to the purchased chemical inputs – primary schools may be more inclined to use organic fertilizers due to SENVINET's focus on primary schools.

Besides relying on rain-fed agriculture, irrigation was a common practice amongst both primary and secondary schools. Whereas seven of the twelve schools who did *not* irrigate their crops mentioned “shortage of water” as the main reason,¹⁴ a large majority (over 85%) of both primary and secondary schools which practiced irrigation used tap water obtained from the municipal council network. One third of the schools in both categories used “collected rain water” as well. A few schools irrigated their crops using water from a borehole and water from a nearby river. Even with the availability of “tap water” in most schools, rainfall and/or tap water may not always be sufficient. In such a case, schools in Nakuru have adopted many ways to cope with water scarcity. Some schools simply do nothing about it; others resort to using water from the storage tanks or boreholes while others send pupils to get water from their homes, nearby estates or from a nearby river.

An indirect type of input is technical assistance from officials. Only a small minority of the schools (14%) had received any assistance with their crop cultivation. All of these except one were primary schools that received advice from SENVINET. Only two schools – one primary and one secondary – had been given assistance by an extension officer of the Ministry of Agriculture and Rural Development. This is a clear indication that there is need for extension officers from MoARD to start working directly with schools practicing urban farming and not through SENVINET, as is seemingly the case at present.

Harvests and use of produce

The respondents were asked to give an indication of how much is approximately harvested on an “average year” and what is done with the produce. It is important to note that crop yields were given in different units and later translated into kilograms to make the figures comparable. In some cases, the respondents had difficulties in recalling the harvests during an “average year” and simply gave the harvests in 2005, while in others, the school had cultivated in only one, two or three cropping years. Keeping this in mind, the figures in Table 5 have to be seen as indications only. The total harvest figures in the table are the sums of the harvests per crop for all schools cultivating that crop (presented in Table A2 in Annex 1). Dividing these by the number of crop-cultivating schools provides an average harvest per school (second row in Table 5). This average harvest appears to be higher for primary schools than for secondary schools. However, as the third and fourth row indicate, this can be largely attributed to the fact that the average plot in the crop-cultivating primary schools was bigger than in the secondary schools; hence, the average harvest per acre (land productivity) was about the same in the two school categories – despite the fact that the use of chemical inputs was much more common in secondary than in primary schools. Again, the figures in Table 5 have to be considered with great care. For instance, a look at the harvests per crop (Table A2) shows that average harvests for some crops (kale, spinach) were much higher in primary schools and for other crops (maize, cabbage) in secondary schools. Detailed measurements of harvests (and inputs) are needed to be able to draw any conclusions here.

¹⁴ Other reasons mentioned were: “rely on rain”, “cannot use tap water”, and “never developed an interest”.

Table 5 Crop harvests and land productivity

	All schools (N=65)	Primary schools (N=32)	Secondary schools* (N=30)
1. Total harvest (kg)	95,501	53,302	38,583
2. Average harvest per school (kg)	1,492	1,666	1,286
3. Average plot size (acres)**	1.52	1.74	1.37
4. Average harvest per acre (kg)	982	957	939

* One secondary school (Moi Forces Academy) had an exceptionally large plot (45 acres) and large harvests and has been left out. ** Including the five plots located outside the school compounds.

Source: School survey 2006 and Table A2.

Table 6 gives an indication of how the produce was used. It is clear that most of the produce was destined for the schools' feeding programmes. In fact, in most of these schools the whole produce was used for the school meals. Selling of produce was done in about 30% of the schools, but that was much more common in primary than in secondary schools. In five schools (all primary), the whole produce was sold, in all other selling schools only part of it. The main 'customers' were school staff and parents or school neighbours. Two schools sold crops to the pupils. One school (Uhuru Primary School) sold its whole harvest of maize (about 4.5 tons) at the Municipal Council market, while another one (Rohi Primary School) sold part of the harvest of various crops to some supermarkets. Finally, in some schools either the school staff or the pupils took the produce home. In most cases, this concerned part of the produce, although in one primary school the whole crop was taken home by the school staff, while in two secondary schools, the students took it all.

Table 6 Use of crops by school category (%)*

Type of use**	All schools (N=48)	Primary schools (N=26)	Secondary schools (N=22)
For school feeding programme	79	69	91
Sold	29	42	14
Staff takes it home	15	8	23
Pupils take it home	17	8	27

* Schools that had started to cultivate crops in 2006 are excluded; hence the lower N's than in the previous tables.

** For each type of use, it was asked whether it concerned "all", "part" or "none" of the produce. In the table, the categories "all" and "part" have been taken together.

Source: School survey 2006.

Constraints with crop cultivation

Table 7 presents a list of constraints related to crop cultivation in Nakuru schools. The respondents were asked to mention the general constraints the school faces with crop cultivation as well as the two most serious constraints in 2005. The most recounted constraint was inadequate rainfall – and probably the reason why the large majority of

schools practice irrigation (see Table 4) Other constraints include pests and diseases, lack of enough land, destruction of crops by wildlife and livestock, lack of security (or theft), lack of capitals and lack of inputs. Pests and diseases were more pronounced amongst secondary schools while primary schools are likely to suffer more from lack of capital or money.

Table 7 Constraints with crop cultivation by school category (%)

	Mentioned as a constraint in general			Mentioned as the most serious constraint in 2005*		
	All schools (N=65)	Primary schools (N=32)	Secondary schools (N=31)	All schools (N=50)	Primary schools (N=25)	Secondary schools (N=24)
Inadequate rainfall	86	81	90	78	80	75
Pests and diseases	59	44	74	40	12	68
Lack of enough land	48	44	52	24	24	25
Destruction by animals**	42	41	45	8	12	4
Lack of security/theft	37	38	39	18	28	8
Lack of capital	37	53	23	12	16	8
Lack of inputs***	37	41	32	16	20	13

* Excludes schools that started crop cultivation in 2006. ** Both wildlife and livestock. *** Including implements and labour.

Source: School survey 2006.

Access to a piece of land for crop cultivation is an important “asset” to urban schools. Urban schools may not be as big (in size) as those in the rural areas. About half (48%) of all the schools – 44% of the primary schools and 52% of the secondary – mentioned that they did not have enough land to grow crops. As much as many of the schools are living with this fact, for one quarter of both primary and secondary schools, it was indeed a major constraint in 2005.

As concerns the most serious constraints in 2005 by school type, primary schools suffered more from destruction of crops by animals, lack of security, lack of capital and to a lesser extent lack of inputs, while secondary schools were affected more by pests and diseases. A number of (public) primary schools do not have properly secured fences and gates and therefore making it easier not only for animals to enter the compound but also for the crops to be stolen by people. The situation becomes even worse during the school holidays or in the evenings when the pupils and teachers are away and there is no watchman to guard the school. Schools near Lake Nakuru National Park have to deal with an additional constant menace: destruction of crops by wild animals from the park, particularly baboons. Lack of inputs is related to lack of capital; further explaining why the proportion of primary schools using purchased inputs was relatively lower (see Table 4).

The benefits of crop cultivation

Respondents were asked about the benefits of crop cultivation for the school in general as well as for the pupils. The results presented in Table 8 are answers as perceived by the respondents¹⁵ and can only be a subjective measure of the benefits of crop cultivation.

Table 8 Most frequently mentioned benefits of crop cultivation, as perceived by the respondents, by school category (%)

	All schools (N=65)	Primary schools (N=32)	Secondary schools (N=31)
<i>For the school:</i>			
- helps in school feeding programme	62	56	65
- school saves money spent on food	39	22	52
- used for learning/teaching purposes	25	19	32
- source of income to the school	12	19	7
<i>For the pupils:</i>			
- they acquire practical skills	80	72	87
- it supplements their meals/lunch	45	47	39

Source: School survey 2006.

As far as the benefits *for the school* are concerned, the schools' feeding programmes figure prominently because the first two categories in Table 8 are both related to it; the first one in the sense of products and the second one in the sense of saving on the costs of food that otherwise has to be bought at the market. The later point is especially important for boarding secondary schools whose expenditure on purchasing food has been rising over the years, while the school fees paid by parents (which is inclusive of boarding fees) has not matched the increase in food prices. In a third of the secondary schools and a fifth of the primary schools, crop cultivation is considered a useful practical teaching tool. Finally, for some schools, crop cultivation (also) serves as a source of income. These are the schools that sell (part of) their harvests. The money was used in various ways: to pay schools bills, to plough back into crop cultivation, to organise a trip or a party for the pupils involved in crop cultivation, or to support needy pupils.

As for the benefits *for the pupils*, the acquisition of practical skills in farming was most frequently mentioned followed by the school feeding argument. The two school types did not differ in this respect. In some schools, other benefits were mentioned as well, though most of these were in one way or the other related to helping needy pupils: 'pupils pay less school fees', 'orphans/poor get lunch', 'money supports needy pupils', and 'pupils may take food home'. In some schools the social aspect was stressed, in the sense that cultivating crops 'encourages the participation in club activities' (three

¹⁵ Mostly a deputy headmaster, a senior teacher or the agriculture teacher.

schools) or ‘the pupils get money’ with which they can organise a trip or a party (four schools).

Livestock keeping

Reasons to start livestock keeping

Livestock keeping was not common among the schools in Nakuru town: 16% of the schools practiced this type of farming. That implies that the large majority of the Nakuru schools did *not* keep any animals. Reasons for not keeping livestock are presented in Table 9. Lack of space and lack of capital were the most frequently mentioned reasons. For about a quarter of the schools, livestock keeping was ‘not a priority now’. Other respondents mentioned lack of adequate security or lack of labour as a reason not to keep livestock. Finally, five schools refrained from keeping livestock because of the local by-laws officially forbidding it. Ten percent of the non-livestock keeping schools had kept animals in the past, mainly for learning purposes. Most of these schools had stopped with the activity because of theft of animals, while others gave up because of lack of interest, wildlife menace, lack of water or expansion of the school.

Table 9 Reasons for not keeping livestock by school category (%)

	All schools (N=98)	Primary schools (N=64)	Secondary schools (N=33)
Lack of space	50	44	61
Lack of capital	50	58	36
Not a priority now	24	16	36
Lack of adequate security	18	27	3
Lack of labour	15	16	15
Fear of by-laws	5	5	6

Source: School survey 2006.

As for the schools that did practice livestock keeping, it was more often found among secondary schools (21%) than among primary schools (10%). Of the 18 schools keeping livestock, 10 had started with the activity since 2000. The two schools with the longest livestock keeping history – since 1988 – were Menengai High School (a secondary, public day school) and Nakuru Hills Special School (a primary, government-run boarding school for mentally disabled children). Menengai High School started with buying cattle for three reasons: to enhance teaching in agriculture, to provide milk for the teachers’ tea, and to supplement the feeding programme to boarders (which the school presently does not have anymore). Nakuru Hills Special School also bought cattle with the aim to produce milk, partly to be sold to get income and partly to be consumed by pupils and teachers. In general, the most frequently mentioned reasons to start keeping livestock at the time had to do with (a) school feeding (to supplement the school’s feeding programme, for the school’s own milk supply, or to provide milk for teachers’ tea), (b) to

generate income for the school, and (c) for academic purposes. In two schools, it was an initiative of the Young Farmers Club. In two other schools (Baruti Primary School and Nakuru Primary School), livestock keeping was initiated by the ILO targeting on needy children (sell the milk and use the money for these children's upkeep). Asked for the present objectives of keeping livestock, the same items as the reasons to start with the activity were mentioned, be it that the learning aspect ('for practical skills') seems to have gained in importance (mentioned by eight of the 18 livestock-keeping schools).

Types of animals, rearing systems and inputs

Improved cattle was the most commonly kept type of animal (11 schools, of which six primary and five secondary). In most cases, it concerned a few animals, i.e. ranging from one to seven. Yet, there were some exceptions (see below). Rabbits were kept in five schools, numbers ranging from one to 23. Two schools kept improved chickens, both in fairly large numbers (200 and 280 at the time of the survey). One school had three pigs and another school four goats at the time of the survey.

Seven of the eleven cattle-keeping schools kept their animals in free range within the school compound. Of the other four schools, two kept them in zero-grazing and two partly in zero-grazing and partly in free range in the compound. The rabbits and chickens were kept in cages. In general, the animals were mostly taken care of by school workers and to a lesser extent teachers and hired labour. The care of the rabbits was primarily the responsibility of the pupils/students. In Kings Academy, the pupils gave a helping hand in the care of the chickens.

Generally, the animals were given a wide variety of feeds. As for cattle, grass, crop residues and purchased feeds were provided in almost all cattle-keeping schools and in five schools the animals were also fed with Napier grass. The chickens were fed with crop residues and purchased feeds, while the pigs of Shunem School survived on crop residues and kitchen waste. Besides feeds, 'modern' inputs were quite common in the livestock-keeping schools. Most animals were improved breeds, received veterinary drugs and were given feed supplements. Professional support was given in only three schools: Menengai Primary School received advisory support from SENVINET, Nakuru High School was given training from an officer of the Ministry of Livestock and Fisheries Development, and Nakuru Primary School was given treatment assistance from a sponsor. In all three cases, it concerned improved cattle.

Types of produce and its use

For all eleven cattle-keeping schools, milk was the most important product. In all cases, part of the milk was used for the teachers' tea and part was sold. In nine schools, the milk was also used for the pupils' feeding programme. In five of the cattle-keeping schools, whole animals were sometimes sold (for instance, the newborn bulls), either to school neighbours or to school staff. The money thus obtained was in most cases ploughed back into livestock keeping. In two schools, an animal was now and then slaughtered for a festivity.

As for the other types of animals, rabbits (five schools) were merely kept as a teaching aid for the agricultural class and for practical purposes in the biology lessons. In one school, rabbits were also sold. The two schools with improved chickens had different objectives with these animals: one (Rohi Primary School) kept them for the eggs to feed pupils and staff, while the other (Kings Academy) kept them for the whole animals to be eaten in the meals during functions in the neighbouring Deliverance Church – the sponsors of the school. The pigs in Shunem Primary and Secondary School were mainly kept for teaching purposes for the agricultural class, but also to generate some income for the school by selling an animal now and then.

Constraints and benefits

The constraints the livestock-keeping schools mentioned were the same as all (urban) livestock keepers are usually facing. The three most frequently mentioned problems were diseases and pests (14 schools), lack of capital (10) and lack of rainfall/drought (8).¹⁶ Asked for the most serious problems in 2005, the same three constraints were mentioned, be it less often (7, 6 and 7 schools respectively).

Despite the problems related to keeping livestock, various benefits of the practice were mentioned by the respondents. *As for the school*, the financial aspect was mentioned most often, either as a source of income for the school (8 schools) or as a means of saving on the costs of milk and ingredients for food (4). Other benefits mentioned in relation to the school as a whole were that livestock is a learning resource (5) and that it supports the school's feeding programme (5). *As far as benefits for the pupils* were concerned, all respondents except two stressed the practical skills that the pupils/students could acquire. Six respondents mentioned the use of the animals' produce (milk) in the school feeding programme as a benefit for the pupils. Finally, in one school, livestock was kept to (amongst others) support the needy pupils.

Some examples

Rohi Primary School – a small, private boarding school located in the north-eastern peri-urban zone of Nakuru Municipality – was an example of livestock keeping on a fairly large scale and as a serious business. The school started to keep livestock in 2004 (a year after the school itself started), with the sole objective to make the school self-sufficient in food (the school started with crop cultivation the year before). At the time of the survey, the school had 14 heads of cattle, 280 improved chickens and four goats. Because the school's compound was not very big (5 acres, of which 1.5 acres were used for crop cultivation), the cattle and goats were kept in zero-grazing and the chickens in cages. School workers took care of the animals. All animals were improved breeds and were given veterinary drugs and feed supplements. The main constraints were diseases/pests and a lack of land. The whole produce of milk and eggs was used for feeding both pupils and staff. Besides the benefit of feeding, the pupils also acquired practical knowledge in

¹⁶ Other constraints included: not enough land (5), a lack of inputs (4), poor housing for the animals (3), a lack of feeds (2), theft/lack of security (2), wildlife menace (1) and a lack of good practices (1).

animal rearing and its importance. For the near future, the school intended to expand the cattle herd to 30 animals, sell the less productive animals and replace them with better breeds.

Another example of a school with large-scale livestock keeping was Nakuru High School – a large public secondary boarding school in Milimani (a high-income area in Nakuru), originating in the colonial period as a school for children of white settlers. The school kept cattle for many years.¹⁷ At the time of the survey, there were 96 heads of improved cattle, taken care of by school workers, hired labourers and some teachers, under the supervision of a farm manager. The animals were partly kept in zero-grazing and partly in free range in the school compound (which was possible because with 180 acres the school has by far the largest compound in Nakuru town). Actually, one of the reasons to start livestock keeping was to utilize the large compound. The second reason was to generate income so that the boarding fee could be lowered, as it was too high for “average families”. The present objectives were (a) to produce as much milk as possible for the school’s feeding programme and (b) to add a practical component to the agriculture lessons. Besides milk production, an animal was slaughtered whenever there was an occasion.

Nakuru Primary School – a medium-size public day school in Paul Machanga Estate in Bondeni (a low-income area of Nakuru) – was one of the schools selected by the International Labour Organisation (ILO) to start with livestock keeping with the aim to generate income with which needy pupils who would otherwise not go to school and end up in child labour, could be supported to go to school. The project started in 2003 when some head of cattle were provided by ILO. However, the project did not last long because ILO stopped its support with the introduction of free primary education in 2003. At the time of the survey, the school had three cows, producing milk for the school’s feeding programme and for selling. In 2005, one animal was sold (and another one bought) to a butcher. The money thus earned was ploughed back into the livestock activities.

Spotlight Secondary School – a small private day school located in Kenlands Estate in the south-eastern, middle-income area of Nakuru Municipality – bought a dairy cow in 2005, with the objective to get milk for the school’s feeding programme (i.e. for the teachers’ tea). However, milk production was below expectations (less than needed for the teachers’ tea). Moreover, the cow proved to be a menace by destroying crops and young trees in the relatively small compound (4 acres). Because of all that, the school decided to sell the cow.

Summerfields Secondary School – a private day and boarding school in Section 58 (located on the middle-income, eastern side of the CBD along the Nairobi-Nakuru highway and south of the railway line) – was one of the five schools where rabbits were kept. The school started to do so in 2002, with the aim to provide a teaching aid to the agricultural class and for practical purposes in the biology lessons. At the time of the survey, there were six animals. In 2005, eight animals had been born and six had died, five of

¹⁷ The respondent (the agriculture teacher) was not sure in which year the school started with keeping livestock.

which had been killed for dissection in the biology classes. The animals were looked after by students, school workers and teachers. The school had faced some problems, namely theft (overcome by taking stern actions on those caught), poor housing (few cages) and foul smells (overcome by proper maintenance).

Tree growing and flower gardening

Almost all schools in Nakuru town were engaged in both tree growing and flower gardening (see Table 1). Compared to crop cultivation and livestock keeping, tree growing and especially flower gardening have a longer history (for instance, one third of the Nakuru schools started with flower gardening before 1990). Yet, for many schools both activities are rather recent activities, starting with it since 2000 (tree growing: 52%; flower gardening: 45%). The strong growth since 2000, especially among the primary schools, may partly be related to the activities of SENVINET. The large majority of the schools participating in the SENVINET programme did so since 2000 and support in tree growing and flower gardening are the two most important activities of this NGO.¹⁸

Tree growing

Table 10 presents the reasons why the schools started to grow trees at the time and what the present objectives of the activity are.¹⁹ In all the schools, an environmental concern (either improvement of school environment, protection against strong winds, provision of shade and/or environmental conservation) was commonly cited as the reason to start tree growing. However, despite the fact that for many schools tree growing was a fairly recent activity, the present objective of tree growing indicates a shift from purely environmental motives to practical motives (i.e. learning and awareness, afforestation and use of products).

Table 10 Tree growing: reasons to start and present objectives (%; N=105)

	Reason to start tree growing	Present objective of tree growing
Improvement of school environment	76	57
Protection against strong winds	55	31
Provision of shade	47	20
Environmental conservation	32	0
For learning/environmental awareness	7	31
Practice afforestation	0	15
Make use of the products	0	14

Source: School survey 2006 (Totals > 100% due to combined answers).

¹⁸ See end of first section of Chapter 2.

¹⁹ Because primary and secondary schools showed relatively small differences in relation to the two variables, only percentages for all schools are presented in Table 10.

Table 11 shows the types of tree growing practiced in Nakuru town. Most schools combine two types. Planting of trees along the fence ('fencing') was preferred not only by many schools with a small compound but also as a way of preserving the existing open spaces with the hope that the school will expand in future and therefore avoid the cutting of these trees. In some schools, a section of the compound was set aside for afforestation or woodlot purposes, i.e. converting open land into a 'forest' or a place specifically designed for tree planting. A few schools practicing crop cultivation opted to practice agro-forestry, i.e. growing crops and trees in the same land.

Table 11 Types of tree growing by school category (%)

	All schools (N=105)	Primary schools (N=66)	Secondary schools (N=36)
Fencing	63	55	78
Afforestation/woodlot	61	65	53
Agro-forestry	19	17	25
Seed or tree nursery	19	20	19

Source: School survey 2006.

'Products' from tree growing include firewood, timber and fruits. One third of the tree-growing schools 'harvested' firewood from their woodlots, while one fifth obtained timber from it. Fruits (mainly guavas, mangoes, avocados) were harvested in about 10% of the schools. In general, secondary schools were more inclined to use the products from the trees than primary schools, especially in relation to firewood and timber.

The responsibility of the tree growing activities lied either by the school itself (55%), by the school together with a club or the agricultural class (19%) or by a club of pupils (23%).²⁰ As for the latter, the Environmental Club was in charge in 14 schools (nine of them primary), the SENVINET Club in seven schools (all primary) and the Wildlife Club in two schools (one primary). One would expect the school to be in charge (either on its own or with a group of pupils) more often in primary than in secondary schools, but that appeared not to be the case. On the contrary, schools where not the school but a club of pupils was in charge were even somewhat more common among primary schools (26%) than among secondary schools (19%). There were three schools where also parents were in charge, in two cases in combination with the school itself and in one case together with the Environmental Club and the agricultural class.

Various types of labour are related to tree growing: land preparation, mulching, planting, pruning, watering and weeding (and in some cases harvesting). Of these, planting, weeding, watering and pruning (in that sequence) were the most common types of work to be done. In most schools (59%), both pupils and adults took part in the tree growing activities; adults being teachers, school workers or hired labourers. In 30% of the schools,

²⁰ Clubs can be the Environmental Club, the SENVINET Club, the Wildlife Club, the Young Farmers Club, the 4-K Club and the Scouts.

only adults were involved. Of these, teachers and/or school workers were the most common persons to take part in the tree growing activities (Table 12). In general, teachers were more often involved in primary schools and school workers in secondary schools. In three (primary) schools, parents were involved, be it only for planting activities.

Table 12 Involvement in tree growing activities by school category (%)

	All schools (N=105)	Primary schools (N=66)	Secondary schools (N=36)
Pupils + teachers	50	61	33
School workers ¹	47	38	61
Hired labour ²	11	14	8
Parents ³	3	5	0
Agricultural class	5	0	14
Club of pupils ⁴	38	35	44

Notes: 1) In one case for planting only and in one case for weeding only.

2) In one case for land preparation only. 3) In all three cases for planting only.

4) Environmental Club (16 cases), SENVINET Club (7), Wildlife Club (6), Scouts (5), Young Farmers Club (4), 4-k Club (1) and Health Club (1). In two cases, the clubs were only involved in land preparation.

Source: School survey 2006.

In all, pupils were taking part in tree-growing activities in 74 schools (70%). In 15 of these, they did all the work, i.e. no adults were involved. Of these, eight were primary schools, six were secondary schools and one was a school with both primary and secondary education. In seven of these schools, it concerned the Environmental Club, in three the SENVINET Club, in two the Wildlife Club, in one school the Young Farmers Club, while in the remaining schools two clubs did the work together.

The respondents were asked what they perceived as the benefits of tree growing for both the school and the pupils.²¹ The most frequently mentioned benefit (73%) for the school was of an aesthetic nature: “it makes the school beautiful”. For the pupils, tree growing as part of their learning experience and creation of environmental awareness was most often stressed (71%). Two benefits of tree growing applied to both the school and the pupils: trees provide the school compound with shade and a cool environment and offer protection against the strong winds and dust (which are quite common in Nakuru). However, the ‘shade’ benefit was more often mention in relation to the school (68%) than to the pupils (31%), while for the wind/dust argument it was the other way around (11% and 57%, respectively). In 30 schools (29%), the use of the wood for firewood or for making furniture was mentioned as a benefit for the school. Related to this, in four schools, selling of such products provided the school with a source of income. Finally, in one (secondary) school – Shiners Girls – a special benefit (related to the school’s feeding programme) for the pupils was mentioned, namely that “they eat the fruits”.

²¹ There were hardly any difference between primary and secondary schools in relation to the benefits of tree growing, so no table is presented here.

The tree-growing schools faced two major challenges: the ‘poor weather’ (lack of water) and the destruction of young trees by animals (both wild and domestic), mentioned by 65% and 52% of the respondents, respectively. This applied to both primary and secondary schools. Some schools (9%) faced a lack of seedlings. In four (primary) schools, young trees were stolen, while another four schools faced time and/or labour constraints. Despite these constraints, the large majority (87%) of (the respondents of) the schools indicated that they intended to plant more trees in the near future, while 19 schools (18%) were planning to start a tree nursery.

Flower gardening

Only three schools in Nakuru town did *not* practice flower gardening. Of the 113 schools that did, all except one started with it “to make the school beautiful”. For some schools (23%), controlling dust and erosion played a role as well, while for other schools (19%), flower gardening was also started as a means for learning and creating environmental awareness among the children. Asked for the schools’ current objectives in relation to flower gardening, these appeared to be largely the same as the reasons to start with the activity.

All schools kept open flower gardens. Almost half of the schools (44%) kept potted flowers as well. Ten schools had a flower nursery, while one (secondary) school had a botanical garden. In less than half of the schools (44%), besides being “beautiful”, the gardens had a practical function as well because they were used for science lessons. Yet, in the large majority (95%) of the flower-gardening schools, the respondent mentioned as benefits for the pupils that they could learn from it as it created conservational awareness and responsibility. Many respondents (45%) saw this aspect also as a benefit for the school itself, besides the improvement of the school’s environment (97%).

The responsibility for flower gardening was in most cases in the hands of the school itself (73%). In the remaining schools, it was either the school together with a club of pupils (16%) or only a club (12%) that was responsible. In as far as pupils were – partly or wholly – responsible for the gardens (i.e. in 27% of the schools), the Environmental Club was the most common one (45%), followed by the Agricultural Class and the SENVINET Club (both 5 schools), the Scouts/Girl Guides (4), the Young Farmers Club and the 4-K Club (both 2) and the Wildlife Club (1). Interestingly, nine of the thirteen schools in which a pupil’s club was fully responsible for the gardens, were primary schools, three were secondary schools and the remaining one was a combined primary and secondary school. In these schools, it was (again) the Environmental Club being responsible in most cases (9 out of 13).

The tasks to be carried out in flower gardening were about the same as in tree growing and were also about equally distributed among adults (teachers, school workers and hired labourers) and pupils. In 40% of the schools, only adults were involved, in 43% both adults and pupils shared the work, while in the remaining 17% (19 schools), pupils did all the work. In most of the latter schools (12), the work was done by ‘all pupils’ (regardless which class). In five schools, the Environmental Club took care of the flowers, while in one (secondary) school the Wildlife Club was in charge and in another (also secondary)

one the Scouts and Girl Guides. In general, primary and secondary schools showed very little differences related to involvement in flower gardening tasks.

The major challenges the flower-gardening schools were facing were comparable with those related to tree growing. Lack of water was the most frequently mentioned problem (63%), followed by destruction of the plants. However, unlike tree growing, it was not only animals that destroyed the flowers (23%) but also pupils or students (31%) and this problem occurred as much in primary as in secondary schools. Yet, as with tree growing, the large majority (91%) of the schools intended to plant more flowers and more different types of flowers as well. Four schools were planning to start a flower nursery.

3 School feeding in Nakuru town

School feeding programmes

The large majority (85%) of the schools in Nakuru had a school feeding programme in 2006. Of the primary schools, one-fifth had no feeding programme, against only three (out of 42) of the secondary schools. The latter can partly be explained by the fact that most boarding (or combined day and boarding) schools – which have a school feeding programme for obvious reasons – were secondary schools. In general, feeding programmes were more common among private and/or church-run schools (96%) than among government schools (78%).

Among the schools *not* having a feeding programme, the most common reasons were that the parents were either not interested or could not afford it and/or the school lacked the necessary funds. Two schools mentioned the fact that they had no cooking facilities as the reason for not having a feeding programme. One of the non-feeding schools did have a feeding programme in the past (1999-2003) but due to lack of funds and lack of cooperation from the parents they had been forced to stop with it. Most of the (respondents of the) non-feeding schools (12 out of 17) said that the school intended to start a feeding programme in the near future.

Although some schools in Nakuru have quite a long history of school feeding,²² most schools started with it fairly recently: 70% since 2000 and 40% even since 2004. In general, secondary schools had a longer school feeding tradition than primary schools. By far the most commonly mentioned reason to start the programme was to make the pupils stay at school at lunch (Table 13). In about 30% of the schools, this reason was specified in the sense that the feeding programme made sure that the pupils did get lunch. Some

Table 13 Reasons* to start a school feeding programme by school category (%)

	All schools (N=99)	Primary schools (N=57)	Secondary schools (N=39)
Make pupils stay at lunch	80	79	80
Make sure pupils get lunch	29	21	41
It is a boarding school	28	16	46
To help needy/poor/orphans	13	18	5

* Only the most frequently mentioned reasons are presented in this table.

Source: School survey 2006.

²² Not necessarily only boarding schools: Baruti Primary School started with its feeding programme in 1964.

schools (13%) started the feeding programme with the specific intention to help those pupils that would otherwise not have lunch at all. This was more common among primary than among secondary schools. Finally, in four schools, the feeding programme was not started to cater for the pupils but only for the school staff.

All school-feeding schools except one provided lunch and almost all (88%) provided morning break tea/coffee. Breakfast and dinner were served in about one-third of the schools, almost all being boarding schools. Afternoon tea/coffee breaks were less common (20% of the schools), especially in primary schools (14%).

Table 14 shows who was eligible for which ‘meals’. In schools where such meals as breakfast, lunch and dinner were being served, (nearly) all pupils were eligible. Morning and afternoon tea (or coffee) breaks were commonly meant for the teachers, although in several schools, pupils were also eligible for these ‘meals’. Other school staff – the non-teaching staff and school workers – were much less often eligible for school meals than the teachers.

Table 14 Eligibility for school feeding programme by type of school population (row %)

	Pupils/students	Teachers	Other school staff
Breakfast (N=33)	97	21	12
Morning tea (N=87)	40	98	25
Lunch (N=98)	99	89	29
Afternoon tea (N=20)	60	90	30
Dinner/supper (N=31)	100	23	10

Source: School survey 2006.

As for the pupils, being eligible did not mean that *all* pupils actually had breakfast, lunch or dinner in these schools. For instance, in one-third of the schools, only pupils who were able to pay participated in the programme. These payments were either included in the school fees or were handed over by the pupil in cash on a daily, weekly or monthly basis. In ten schools (all primary), only the poor and needy pupils, including orphans, were eligible.

In most of the school-feeding schools (70%), the feeding programme at the time of the survey had not changed since the programme had started. In the other 30% of the schools it had, however. In all but one of the latter schools, the programme had expanded in terms of the number of meals provided. Moreover, in three quarters of the schools with a feeding programme, eligibility had been expanded. This was mainly due to an increase of the pupil population, but in some schools also because more pupils had joined the programme. Yet, in five schools, the programme had actually *decreased* in terms of eligibility and numbers of pupils taking part in it, due to such reasons as lack of money (cutting on costs), parents who could no longer afford it, or a decrease of the children’s population.

Almost all schools with a feeding programme had a weekly schedule. In most cases, the school staff was responsible for the planning and implementation of this schedule, but in a quarter of the schools it was given in the hands of a catering business. The most common type of breakfast (served in 94% of the schools providing this meal) consisted of tea with milk and bread, *chapatti*²³, *mandazi*²⁴ and/or eggs. In over half of the schools, this dish was alternated with porridge. Morning break consisted usually of tea with milk, in about half of the schools in combination with some bread, *chapatti*, *mandazi* or eggs. The dishes provided with lunch are shown in Table 15. Rice was the most common basic ingredient, most of the time served with beans stew, although various other rice dishes were served as well.²⁵ *Githeri*²⁶ was also very common, especially in secondary schools. *Githeri* is a common dish in secondary schools because of the availability of maize and beans and it also easier to prepare for a large number of students. Another popular basic ingredient in Kenya is *ugali* (stiff maize porridge), which was in most cases served with beef stew and otherwise with vegetables. *Chapattis* were served in about one third of the schools, almost exclusively in primary schools.²⁷ Afternoon break consisted almost solely of tea, either or not with milk. Finally, dinner showed to some extent similarities with the lunch schedule, be it that the various *ugali* dishes dominated (all schools), followed by *githeri* (55%) and various rice dishes (45%).

Table 15 Types of dishes served at lunch by school category (%)

	All schools (N=98)	Primary schools (N=56)	Secondary schools (N=39)
Rice with beans stew	92	75	100
Other rice dishes	46	55	31
<i>Githeri</i>	70	52	97
<i>Ugali</i> with beef stew	50	50	49
<i>Ugali</i> with vegetables	33	34	31
Other <i>ugali</i> dishes	13	11	13
<i>Chapatti</i> dishes	34	54	5

Source: School survey 2006.

School feeding in relation with school farming

One of the main objectives of the present study was “to establish the contribution of school farming to school feeding programmes”. Although it is difficult (and very time-

²³ Flat pan fried ‘bread’ made of wheat flour (similar to a pancake).

²⁴ Deep fried ‘bread’ made of wheat flour (similar to a doughnut).

²⁵ Such as rice with *dengu* (green grams) (18% of the schools), with beef stew (16%) or with a vegetable like *sukuma wiki*, cabbage or spinach (5%). In six schools (6%), plain rice was also served as lunch.

²⁶ A dish of boiled (sometimes then fried) maize and beans.

²⁷ *Chapattis* were served with green grams (15%), beans stew (11%), beef stew (6%) or vegetables (1%). Lunch providers in primary schools prefer *chapattis* because they are easy to prepare and serve than *ugali*.

consuming) to measure this in exact quantities of ingredients, there are various other indications showing that there are strong links between school farming on the one hand and school feeding on the other.

To start with, more than half (52%) of all the schools in Nakuru practiced school farming and had a school feeding programme as well. However, as Table 16 shows, not all schools with a feeding programme practiced crop cultivation (61%). On the other hand, the table also shows that almost all schools (92%) practicing crop cultivation had a school feeding programme as well. This relationship between crop cultivation and school feeding appeared to be particularly strong among secondary schools. As for livestock, all 18 schools keeping animals had a feeding programme as well.

Table 16 Relationship between crop cultivation and school feeding by school category

	All schools	Primary schools	Secondary schools
School feeding programme: yes	99 (=N)	57 (=N)	39 (=N)
+ crop cultivation: yes	61%	49%	77%
Crop cultivation: yes	65 (=N)	32 (=N)	31 (=N)
+ school feeding: yes	92%	88%	97%

Source: School survey 2006.

This link between school farming and school feeding was also shown by several findings in earlier sections of this paper.²⁸ First, for half of the schools, at least one of the reasons to start crop cultivation at the time was to support the school feeding programme. Second, in most crop-cultivating schools, part or all of the produce was used for the schools' feeding programme at the time of the survey; in most of these schools, it concerned the whole produce. Third, in the majority of the crop-cultivating schools, by far the most frequently mentioned benefit of crop cultivation for the school was the link with the school's feeding programme, both direct – through the supply of ingredients – and indirect – by saving money otherwise spent on the purchase of food. Fourth, all cattle keeping schools started to keep these animals for the school's own milk supply and in almost all of these schools, the milk was indeed used to feed the pupils and/or the school staff.

More detailed information on the use of crops for the schools' feeding programmes is presented in Table A3 (Annex 1) and in Table 17. For each crop cultivated by the schools, it was asked in how far the produce was used for the feeding programme, i.e. "all of it", "part of it" or "none". The results for *all* crops are presented in Table A3. In general, 80-100% of the schools used part or all of the produce of each crop for the school's feeding programme. Moreover, using "all of it" for the feeding programme was more common than "part of it". Table 17 shows that there are marked differences between primary and secondary schools regarding the use of the produce. Although the

²⁸ See the sections on "Crop cultivation" and "Livestock keeping" above.

numbers of the two school categories are small, the figures nevertheless do indicate that using the produce of the (four major) crops for the school's feeding programme was more common among secondary than among primary schools.

Table 17 Major self-produced crops used for school feeding programme by school category (% of schools cultivating that crop)*

Crop type	N**	All schools	Primary schools	Secondary schools
Kale (<i>sukuma wiki</i>)	35/20/14	83	75	93
Beans	28/11/17	75	55	88
Maize	23/13/9	83	69	100
Cabbage	19/5/13	90	60	100

* The categories "all of it" and "part of it" are combined in this table.

** N's refer to schools producing that particular crop and concern "all schools", "primary schools" and "secondary schools", respectively.

Source: School survey 2006.

Table 18 gives an impression regarding the annual period of time the four most commonly cultivated crops can normally be used for the school's lunch programme. Two things are important to note here. First, it concerns only those schools growing (one or more of these) crops *and* using these for the school's lunch programme. Second, the figures in the table can be no more than crude indications because they are based on hindsight observations by the respondents. With these imperfections in mind, the table nevertheless indicates that the 27 schools cultivating kale were on average able to use the crop for the lunch programme for a period of about six months. Nine schools produced sufficient kale the whole year through (seven of these being primary schools). Even so, beans lasted on average for over three months, maize almost five months and cabbage almost three months. One school had enough self-produced beans for the whole year, three schools did the same for maize and one school for cabbage; these were all primary schools.

Table 18 Average lengths of period (in months) of use of self-produced ingredients for lunch and morning break, by school category (averages)*

Ingredient	N*	All schools**	Primary schools	Secondary schools
Lunch: - kale (<i>sukuma wiki</i>)	27/15/12	6.1	7.4	4.5
- beans	16/5/11	3.2	4.4	2.7
- maize	15/8/7	4.8	6.6	2.6
- cabbage	14/2/11	2.8	6.5	1.8
Morning break: - milk	9/4/5	9.9	9.5	10.2

* N's refer to schools producing that particular crop *and* using it for the school's feeding programme and concern all schools/primary schools/secondary schools, respectively.

** The distribution of periods for each of the four major crops is shown in Table A4 (Annex 1).

Source: School survey 2006.

Table 18 also shows that primary schools managed to do longer with their self-produced crops than secondary schools. Although the numbers of schools are quite small, the picture is consistent (and applies also to other crops such as spinach, onions, potatoes and carrots – crops that were all being cultivated by both primary and secondary schools). The reason for this may be found in larger average harvests in primary schools (kale, beans; see Table A2), but also in smaller numbers of eligible pupils for lunch.

Nine schools (out of eleven) with cattle used (part of) the milk for their feeding programme. All of these schools used the milk for the morning break tea or coffee, six also for breakfast and three also for the afternoon break. On average, the self-produced milk of these nine schools could cover their needs for about ten months (Table 18). Primary and secondary schools showed no difference in this respect. Five of the schools – two of them primary and three secondary – had enough milk throughout the year.

School feeding and nutrition

Anthropometric measurements – height and weight – were taken from the class 1 children of all primary schools, in addition to recording their age. In principle, *all* children in class 1 were selected. However, if a school had two or more streams in class 1, only one stream was (randomly) selected. All primary schools except two (i.e. 69 schools) were thus covered. Of these, 58 schools could be used for analysis (in the other 11 schools, the group of class 1 pupils was smaller than 20).²⁹ In all, a fairly representative picture was obtained of the nutritional condition of all children in the 5-7 years range of the whole municipality.

Table 19 shows the results of the anthropometric measurements for the whole population of class 1 pupils in the 5-7 years of age range in Nakuru town. *Weight-for-height* is a measure for acute malnutrition, i.e. the child is too light for its height (expressed as ‘wasted’). The table shows that almost 10% of the children appeared to be wasted. Wasting was slightly more common among boys than among girls. About 1.5% of the children were severely wasted (1.9% of the boys and 1% of the girls). *Height-for-age* is a measure for chronic malnutrition, i.e. the child is too short for its age (expressed as ‘stunting’). Almost 8% of all the children were stunted and 1.5% even severely. Stunting

Table 19 Percentages of class 1 children being wasted, stunted and underweight, by sex

Measurement*	N**	All children	Girls	Boys
Wasted (WHZ<-2)	2787/1374/1413	9.3	8.7	9.9
Stunted (HAZ<-2)	2812/1395/1417	7.8	5.6	10.0
Underweight (WAZ<-2)	2822/1396/1426	10.1	6.8	13.4

* On the meanings of WHZ, HAZ, WAZ and <-2, see Annex 2.

** All children/girls/boys, respectively.

Source: School survey 2006.

²⁹ For more details on the anthropometrical data collection, the characteristics of the study population (class 1 children), and the analysis, see Annex 2.

was much more common among the Nakuru boys than among the girls. Finally, *weight-for-age* is a combination of the previous two measures and is an expression of the overall nutritional condition of a child (termed as ‘underweight’). Ten percent of all children appeared to be underweight. The prevalence of underweight among boys appeared to be twice as high as among girls.

Based on the survey data, an attempt has been made to see whether a relationship could be found between school feeding, on the one hand, and the nutritional condition of the class 1 primary school pupils, on the other. Put otherwise: do schools catering for lunch have a lower percentage of undernourished children than schools not catering for lunch? This appeared to be a rather complicated analysis, which is explained in Annex 2. In the end, two groups of primary schools could be compared, the first group consisting of 24 “schools catering for lunch” (see Table 20) since 2005 or before and (part of) the class 1 pupils being eligible. The second group (32 schools) did not meet these conditions and were labelled as “schools not catering for lunch”. For both groups of schools, it was established whether the percentage of children being ‘wasted’, ‘stunted’ and ‘underweight’ was lower or higher than the overall averages (the cut-off points) as presented in Table 19. The results of this exercise are presented in Table 20.³⁰

Table 20 Relationship between school feeding and nutrition (primary schools)¹

		Schools catering for lunch ³ (N=24)	Schools not catering for lunch ⁴ (N=32)
% of pupils wasted: ²	- up to 9.3%	67%	63%
	- more than 9.3%	33%	37%
% of pupils stunted: ²	- up to 7.8%	71%	56%
	- more than 7.8%	29%	44%
% of pupils underweight: ²	- up to 10.1%	79%	50%
	- more than 10.1%	21%	50%

Notes: 1) For a detailed explanation on the method of analysis, see Annex 2.

2) Cut-off points are taken from the average percentages (all children) as presented in Table 19.

3) These are the schools catering for lunch, starting with it before 2006 and class 1 pupils being eligible.

4) These are the schools either (a) with a feeding programme but not catering for lunch, and/or (b) with a feeding programme but class 1 pupils were not eligible, and/or (c) with a feeding programme but with 2006 as the starting year, and/or (d) without a feeding programme whatsoever.

Source: School survey 2006.

Table 20 indicates that there is no relationship between school feeding (i.e. providing lunch), on the one hand, and the percentage of children being wasted. The proportion of wasted children in the schools where it was either lower or higher than the average proportion for all children was the same in schools *with* as in those *without* the provision of lunch. As far as the other two anthropometric measures – stunting and underweight – are concerned there seems to be a (positive) relationship between feeding and nutrition:

³⁰ More detailed results are presented in Annex 2, Table A5.

among the schools where lunch was catered for, more of these had a lower level of wasting and underweight than among the schools where lunch was *not* catered for. However, we have to be careful with drawing conclusions from these figures. The major ‘weakness’ is that from the survey data, we do not know how many class 1 children in the primary schools catering for lunch actually *did* eat lunch at school. Secondly, exact data can only be obtained by means of food recalls.³¹ Hence, the figures presented in Table 20 can only be seen as tentative results.

³¹ Food recalls were done in March and April 2007 among pupils in two schools in low-income areas of Nakuru. In each school, food recalls and anthropometric measurements were done for a group of children that *did* eat lunch at school and a group of children that *did not*. Since data entry, data processing and data analysis of food recalls are very time-consuming, the findings of these data will be presented in a next publication.

4 Conclusions

The *Gardens for Life* project in Kenya

As the costs of food continue to increase, some schools in Kenya have started to combine school farming with their school feeding programme, i.e. using what they produce in the school feeding programme. These initiatives are mainly at the school level and for those schools with enough land to cultivate crops and keep animals. There are also other initiatives that encourage the combination of school farming with school feeding. One such recent initiative is the *Gardens for Life* project run by the Kenya Youth Education and Community Development Programme. Two of the project's objectives are (1) to reintroduce agriculture in primary schools (after the exclusion of agriculture as an examinable subject in 2000) as an essential and practical method of equipping children with easy techniques, and (2) to encourage schools to grow crops for lunch for the pupils. The latter has two major benefits: it leads to an improvement of the pupils' nutritional condition (and hence their attentiveness and performance in class) and it drastically reduces the cost of lunch provided in schools. Moreover, farming techniques are as much as possible organic (using for instance kitchen waste to make compost manure) and new, nutritious crops are introduced.

The programme has started as a pilot project in 20 public schools in three districts (Nakuru, Laikipia and Nyandarua). The results so far are very promising. Nyandarua Boarding Primary School in Nyahururu town (with 750 pupils) saved Ksh. 200,000 in 2004 on the expenses for lunches. The school has introduced carrots, spinach and courgettes as daily supplements to the usual maize, beans and potatoes. Chemicals are hardly being applied; instead, natural methods to control pests and other crop diseases are applied. The one-acre plot even produces surpluses of vegetables, which are sold to the neighbouring communities as 'chemical-free' food. Another school, Munyaka Secondary in Laikipia District, known as a 'slum school', saw an upsurge of enrolment by 38% after the introduction of the *Gardens for Life* project. The school introduced radish plant, garlic, onion and beet roots, all known for their high vitamin contents. The health of the students has improved due to the quality of meals offered at the school. Students from poor families unable to pay school fees also benefit from the introduction of the work-for-fees programme, whereby the student performs labour on the school's plot to raise money for the fees. By so doing, these pupils can stay at school and finish their education.³²

³² <http://www.nationmedia.com/dailynation/printpage.asp?newsid=46980>

The current practice in Nakuru Municipality

School farming

School farming is very common in Nakuru town. Almost all primary and secondary schools are engaged in flower gardening and tree growing, over half of the schools practice crop cultivation and some schools keep some livestock. In general, for a majority of the schools farming is a fairly recent activity, i.e. they started with it after the year 2000. Flower gardening is mainly practiced for esthetical reasons (“it makes the school beautiful”). Tree growing is an important activity, especially from an environmental point of view. Besides being an element in environmental conservation and beautification, the trees also protect against strong winds (involving dust, especially in the dry season) and provide shade.

Crop cultivation is more common among secondary schools than among primary schools. For schools *not* engaged in this activity, lack of land, lack of capital and loss of crops are the main obstacles. Sizes of plots for growing crops differ enormously, but most of them are small, i.e. less than one acre. In most schools, the responsibility for crop growing lies with the school itself in combination with a group of pupils (the Agriculture class or a ‘club’). The work to be done is usually also shared, i.e. by adults on the one hand (teachers, school workers, hired labour) and pupils on the other. A variety of crops is cultivated, but kale, beans, maize, cabbage, spinach and potatoes dominate. Tools are simple; only a few schools use a tractor or ox-plough. Material inputs are widely used; chemical inputs (fertiliser, pesticides, insecticides) are very common in secondary schools but much less in primary schools. A large majority of the schools practice some kind of irrigation.

Livestock keeping by schools is not common in Nakuru. Lack of space and capital are the main obstacles, but for quite a number of schools it is (also) not a priority. Most of the few schools that do have animals keep improved cattle, either in zero-grazing or in free range in the school compound. Pupils are usually not involved in activities related to livestock.

School farming and school feeding

School farming – crop cultivation in particular – and school feeding are strongly related. Of the 65 crop-cultivating schools in Nakuru, 60 have a feeding programme as well. Most of the schools use the produce for their feeding programme (mostly lunch), although in some schools part of the harvest is also sold or taken home by staff or pupils. Another indication of the relationship between crop cultivation and school feeding is the fact that the two most frequently mentioned benefits of crop cultivation are that it helps in the school’s feeding programme and that the school saves money spent on food. Interestingly, these are the two major elements of the *Gardens for Life* project (but only six of the 116 respondents said to have heard about this programme).

The question whether school feeding – and especially providing lunch – leads to a better nutritional condition of the pupils is not easy to answer on the basis of the survey

data. Yet, the results do indicate that the proportion of class 1 pupils in primary schools being stunted and underweight is lower in schools catering for lunch.³³

Two 'success stories'

One of the schools with a relatively high degree of self-sufficiency is *Menengai Primary School* – a public day school with about 500 pupils in the medium-income area of Section 58. The school started to cultivate crops in 1995 and to keep livestock two years later. On the school's *shamba*, maize, beans, kale, cabbage and tomatoes are cultivated. The work is done by hired labour (using simple tools like *panga* and *jembe*) and the farming system is purely organic. Crops are irrigated during dry periods, as rainwater is stored in tanks. The harvest is almost entirely used for the school's feeding programme. Kale, cabbages and maize are produced in sufficient quantities to last the whole year. Moreover, the school keeps three heads of dairy cattle producing milk for the morning break tea throughout the year. From the start of its farming activities, the school has been a member of SENVINET, which includes such activities as tree growing, flower gardening, garbage management, grass planting, organic gardening (including using leaves from the trees for mulching), advice with cattle keeping and water catchment for irrigation purposes. The school started with its feeding programme in 1990, for which pupils and teachers are eligible. The main beneficiaries are the class 8 pupils who remain in school during lunch time. There are also some visually handicapped children at the school who are being fed (at no pay). The school caters for breakfast (normally, tea and *uji*), morning break (tea and bread) and lunch (*ugali* + meat + *sukuma wiki* on Monday and Thursday, *pilau* on Tuesday and Wednesday and *chapatti* + meat + *sukuma wiki* on Friday). The nutritional condition of the selected class 1 pupils was better than the average for all schools (5.4% wasted, 8.1% stunted, 0% underweight).³⁴

An even more appealing example is *Rohi Primary School* – a boarding school with about 170 pupils located in the peri-urban area of Kiamunyeki. The school is fairly new; it started in 2003. In the same year, the school started to cultivate crops and one year later also to keep livestock. In 2006, six different crops were cultivated on its two plots – one of 1.5 acres in the school compound and one of 2 acres some 200 metres away. The school uses both organic and chemical (fertiliser, pesticide, insecticide) inputs. Because of the presence of a borehole, crops can be irrigated during the whole year if necessary. School workers do all the work (with *panga* and *jembe*). At the time of the survey, the school also had 14 heads of cattle – producing sufficient milk for breakfast, morning break tea and afternoon break tea during the whole year – as well as 280 chickens and

³³ More detailed information on this relationship will be provided after the data collected during the second fieldwork in March/April 2007 (food recalls and anthropometric measurements) have been analysed.

³⁴ During a visit in June 2007, it appeared that in the course of 2006 (i.e. after the survey) the school's teacher in charge of the farming activities had been transferred to another school. It took some time before another teacher was found to take over these responsibilities. As a result, the *shamba* had been seriously neglected during the first half of 2007. It shows that one of the key conditions for making school farming a success is the motivation, dedication and enthusiasm of the teacher in charge.

four goats.³⁵ The school does not receive any advice for its crop cultivation and is also not a member of SENVINET. Being a boarding school, the school obviously has a feeding programme, including all meals per day and also in the weekends. Lunch consists of either *githeri* dishes or rice dishes and three times a week also fruits. Dinner consists of *ugali + sukuma wiki* throughout the week (with beef on Wednesday and Friday). All self-cultivated crops are – wholly or partly – used for the school’s feeding programme and four of these (kale, spinach, onions and maize) are produced in sufficient quantities to last for the whole year. Carrots normally last for six months and tomatoes for four. Part of the tomato harvest is sold to supermarkets, because the school produces first grade tomatoes in a green house.³⁶

The potential in Nakuru Municipality

The above ‘success stories’ show that schools in Nakuru can reach a high degree of self-sufficiency for their feeding programmes, thus providing their pupils with at least a decent lunch and at the same time saving on the costs of the programme. That raises the question in how far other schools in Nakuru are able to do the same. Although we do not pretend to be able to answer this question satisfactorily, a few things can be said, however. In doing so, we will focus on two basic natural resources (land and water) and the importance of support.³⁷

“Not enough land” was by far the most frequently mentioned answer to the question why the non-crop-cultivating schools did not practice crop cultivation. Indeed, half of these schools have a school compound of less than three acres (and some even of less than one acre), so it is not very likely that there is much space left for a *shamba*. All ten schools with a compound of one acre or less did not grow crops. On the other hand, there were eight schools with a compound of 1.5-2 acres that did cultivate crops, be it, obviously, that these *shambas* are small. There is even one school (St. Nicholas Mixed Secondary School) cultivating *sukuma wiki* on a *shamba* of only 400 m² and using it as an ingredient for its feeding programme throughout the year. There are also schools that do have sufficient land but do *not* grow crops for other reasons than lack of land (such as lack of capital, fear of theft, destruction of crops by animals, or some other reason). For instance, 20 of the non-crop-cultivating schools have a compound of five acres or more. It is hard to imagine that the compounds of all these schools do not provide sufficient space for a *shamba* (even if the school is big in terms of pupils and hence buildings). Finally, there is also a group of about 30 schools that do grow crops, but still have a compound of at least five acres ‘left’ (i.e. after deducting the size of the *shamba* from the size of the whole school compound). In all, even though the compounds of some schools

³⁵ More detailed information on livestock keeping at Rohi Primary School was provided in Chapter 2 > Livestock keeping > Some examples.

³⁶ No data on the nutritional condition of the 22 class 1 pupils are available because no measurements could be done due to the tight schedule of the pupils.

³⁷ Of course, other factors play a role as well in developing school farming and feeding (capital, organisational skill, motivation, etc.) but these are beyond the scope of this study.

are indeed too small for a *shamba*, the data suggest that for most schools the availability of land is not a major constraint to start or expand crop cultivation.

Nakuru has a relatively dry climate, so the town's water supply is a constant problem, especially in the dry season. Most crop-cultivating schools do (have to) irrigate their crops. This is mainly done with water from the municipal taps (which is officially not allowed), while some schools use collected rainwater (as well). Despite this, by far the most frequently mentioned problem with crop cultivation concerns the weather: lack of rainfall, irregular rainfall, drought, etc. This indicates that most schools do face problems with watering their crops. Not every school has the benefit of its own borehole, as is the case with Rohi Primary School, but the other 'success story' of Menengai Primary School – catching rainwater and storing it in tanks – shows that this problem can be solved.

The latter brings us to the importance of support. The rainwater catchment system of Menengai Primary School was realised with the support of SENVINET. This NGO is an important player in the farming activities of the schools in Nakuru. Almost half of the schools are 'members', i.e. they are being assisted in their farming and environmental activities by SENVINET. However, it concerns mainly primary schools, which is probably the reason that organic farming (one of the objectives of SENVINET) is much more widespread among primary schools than among secondary schools. Whatever the role of SENVINET in Nakuru's school farming may be,³⁸ it is conspicuous that only seven respondents said that their school had received assistance from this NGO during the cropping season of 2005. More so, the Ministry of Agriculture was mentioned by only two respondents.

All this indicates that in terms of land and water and of support for school farming, much can be improved in Nakuru. The *Gardens for Life* project may serve as a leading principle. The above-mentioned example of Nyandarua Boarding Primary School in Nyahururu shows that even on a plot as small as one acre, remarkable results are possible.

³⁸ A separate study on the impact of SENVINET on Nakuru's school farming would be interesting.

Annex 1 Additional tables

Table A1 Crops cultivated in 2006 by school category

Crop type	All schools (N=65)		Primary schools (N=32)		Secondary schools (N=31)	
	N	%	N	%	N	%
Kale (<i>sukuma wiki</i>)	39	60	23	72	15	48
Beans	31	48	13	41	18	58
Maize	29	45	18	56	11	36
Cabbage	20	31	5	16	14	45
Spinach	11	17	5	16	5	16
Potatoes	10	15	4	13	6	19
Carrots	6	9	3	9	3	10
Onions	6	9	1	3	5	16
Cow peas	5	8	5	16	0	0
Tomatoes	4	6	3	9	1	3
Bananas	3	5	2	6	1	3
Millet	2	3	0	0	2	6
Dhania	1	2	0	0	1	3
Green grams	1	2	1	3	0	0
Pepper	1	2	1	3	0	0
Wheat	1	2	0	0	1	3

Source: School survey 2006

Table A2 Crop harvests in 2006 by school category (kgs)*

Crop type	All schools (N=65)		Primary schools (N=32)		Secondary schools (N=30)	
	N	Average	N	Average	N	Average
Kale (<i>sukuma wiki</i>)	32	878	17	1390	14	318
Beans	27	319	11	374	16	282
Maize	21	1725	13	1313	8	2396
Cabbage	17	495	4	183	12	341
Spinach	8	296	4	482	4	109
Potatoes	10	436	4	420	6	447
Carrots	5	402	3	450	2	330
Onions	5	302	1	960	4	138
Cow peas	4	293	4	293	0	0
Tomatoes	2	240	2	240	0	0
Bananas	3	82	2	93	1	60
Millet	2	90	0	0	2	90
Dhania	1	2	0	0	1	2
Green grams	1	1	1	1	0	0
Pepper	1	4	1	4	0	0
Wheat	1	1800	0	0	1	1800

* For some crops, N's are smaller than in Table A1 due to missing or incomplete harvest data. One secondary school with an exceptionally large plot (45 acres) and large harvests has been left out.

Source: School survey 2006

Table A3 Crops used for school feeding programme

Crop type	N	All of it		Part of it		All + part of it	
		abs.	%	abs.	%	abs.	%
Kale (<i>sukuma wiki</i>)	35	22	63	7	20	29	83
Beans	28	15	54	6	21	21	75
Maize	23	16	70	3	13	19	83
Cabbage	19	13	68	4	21	17	89
Spinach	10	6	(60)	3	(30)	9	(90)
Potatoes	10	3	(30)	5	(50)	8	(80)
Carrots	5	1	(20)	3	(60)	4	(80)
Onions	5	4	(80)	1	(20)	5	(100)
Cow peas	5	1	(20)	2	(40)	3	(60)
Tomatoes	4	2	(50)	1	(25)	3	(75)
Bananas	3	3	(100)	0	(0)	3	(100)
Millet	1	1		0		1	
Dhania	1	0		1		1	
Green grams	1	1		0		1	
Pepper	1	0		0		0	
Wheat	1	1		0		1	

Note: For some crops, N's are smaller than in Table A1 because data on the use of produce were not applicable for schools that had started to cultivate crops in 2006.

Source: School survey 2006

Table A4 Major crops used for lunch by length of period in months (N)

Period	Kale (N=27)	Beans (N=16)	Maize (N=15)	Cabbage (N=14)
< 1 month	-	2	2	3
1-3 months	13	9	6	7
4-6 months	4	3	3	3
7-9 months	1	1	1	-
10-12 months	9	1	3	1
<i>Average nr. of months</i>	<i>6.1</i>	<i>3.2</i>	<i>4.8</i>	<i>2.8</i>

Source: School survey 2006.

Annex 2

Anthropometrical data collection and analysis

Data collection

Tools

Bathroom weighing scales and non-stretch tape measures were used in assessment of the anthropometry of children. Bathroom scales that could weigh to maximum 210 kg at an accuracy of 0.5 kg were used in the assessment of weight of children. The non-stretch tape measures calibrated to measure to a maximum 175 cm to an accuracy of 0.1 cm were used.

Measuring techniques

Procedures as described and recommended by Gibson (1990), UNSO/NHSCP (1986) and WHO (1983) were followed:

- *Weight:* In respect of the rights of the child, the children were measured while in minimal clothing, thus they were requested to remove heavy clothing such as heavy jackets, sweaters and shoes. The children were asked to step onto the bathroom scale and the weight was read to the nearest 0.5 kg. The following quality control measures were observed in the process of weighing, that before each child was weighed, the pointer of the scale was always adjusted to zero, that the floor surface where the scale was placed was uniformly flat, that the person making the reading was appropriately positioned to make correct reading and that recording was done immediately. Two readings per child were made and the average calculated only if the difference between them was not more than 0.5 kg. Otherwise, a third reading was made and the two meeting this condition were recorded.
- *Height:* The child was made to stand upright against a board or a smooth classroom wall as the reader ensured that the feet were firmly on the flat floor and heels against the board of wall, the neck was well extended, arms against the body and the eye flexed at a straight angle and that a flat head piece was firmly in contact with the top of head. The position of the head piece was marked on the board or wall, and the distance from the bottom measured with the tape measure. The height was recorded to the nearest 0.1 cm. Two readings per child were made and the average calculated only if the difference between them was not more than 0.5 cm. Otherwise, a third reading was made and the two meeting this condition were recorded.
- *Determination of children's age:* Where possible, dates of birth of the children were recorded from the school registers. Otherwise, the children were asked for their date of birth.
- *Quality control:* The validity and reliability of anthropometric based findings was founded on a number of strategies heralded by very careful selection and training of assessors, calibration of equipment for accuracy, enhanced with close supervision that aimed at ensuring that appropriate measuring techniques were observed and the correct readings were recorded. At the processing level, data were cleaned

prior to their processing and finally, the in-built EPI-NUT quality check teased out, at child level, the measurements that did not concur the requirements.

Classification for nutritional status

The children’s nutritional status was classified based on the WHO (1983) International Reference Growth Data for children. The growth data provides reference median weights for age and height, as well as median heights for age of healthy children, growing normally up to the age of 18 years. In addition, the data provides the equivalent values for ± 1 , 2 and 3 standard deviations (also known as Z-scores) from the median value. The classification adopted the globally accepted cut-off points as described by Médecins Sans Frontières (1995) as shown below:

Z-Score/Median based cut-off points for indicators of nutritional status				
Nutritional status*	Z-Scores			
	Normal	Global malnutrition	Moderate malnutrition	Severe malnutrition
WHZ, WAZ, HAZ	≥ -2.00	< -2.00	$-3.00 - -2.00$	< -3.00

* WHZ = Weight-for-Height Z-score; WAZ = Weight-for-Age Z-score; HAZ = Height-for-Age Z-score

In this case, children growing normally with normal nutritional status are expected to have their WHZ, WAZ and HAZ not deviating for more than the 2 standard deviations below the reference median.

Relationship between school feeding and nutrition

Based on the survey data, an attempt has been made to see whether there was a relationship between school feeding, on the one hand, and the average nutritional condition of the class 1 primary school pupils, on the other. This is a complicated exercise, involving the following steps:

1. It concerns the primary schools because anthropometrical measurements of children have been taken in these schools only (i.e. the class 1 pupils). Two schools where no measurements could be done had to be excluded. Another eleven schools were excluded because the number of measured pupils was less than 20. The two boarding schools were excluded as well because all children had not only lunch at school but breakfast and supper as well. Finally, two schools were excluded because of incomplete data on the feeding programme. By doing so, 56 schools remained for further analysis.
2. To qualify for “lunch: yes”, schools had to meet the following conditions: (a) Lunch had to be catered for. (b) The lunch programme should be in place since at least 2005, because otherwise the period between the start of the lunch programme and the time of pupils’ measurements would be too short to allow for any conclusion. (c) The pupils from class 1 – or part of them – had to be eligible for the lunch programme; this condition is the tricky one, because from the survey data it was not clear how many class 1 pupils actually *did* have lunch at school. In

- all, 24 schools met these conditions and were thus labelled as “schools catering for lunch” in Table A5 below and Table 20 in the main text.
3. The remaining 32 schools were labelled as “schools not catering for lunch”. Thirteen of these were the primary schools with no feeding programme whatsoever. The other 19 schools did have a feeding programme, but did not qualify because of the following reasons: starting year 2006 (7 schools), class 1 pupils not eligible (11 schools), and no lunch catered for (1 school).
 4. To establish any possible relationship between school feeding (“catering for lunch” or not, as defined above) and the nutritional condition of the children, the question to be answered was: do schools catering for lunch for class 1 pupils have a lower percentage of undernourished children than schools not catering for lunch? The cut-off points (“lower” or “higher”) used were taken from the average percentage of children being ‘wasted’, ‘stunted’ or ‘underweight’, as shown in Table 19, i.e. 9.3%, 7.8% and 10.1%, respectively. In first instance, a four-class categorisation of each type of measurement was made based on the halves of each cut-off point (see Table A5). Table 20 in the main text is a simplified version of Table A5, only showing the percentages of schools with percentages of class 1 pupils lower or higher than the overall averages of wasted, stunted and underweight children.

Table A5 Relationship between school feeding and nutrition (primary schools)

		Schools catering for lunch ² (N=24)	Schools not catering for lunch ³ (N=32)
% of pupils wasted: ¹	up to 4.6%	33%	47%
	4.7 – 9.3%	33%	16%
	9.4 – 14.0%	13%	22%
	> 14.0%	21%	16%
	Total	100%	100%
% of pupils stunted: ¹	up to 3.9%	50%	34%
	4.0 – 7.8%	21%	22%
	7.9 – 11.8%	8%	16%
	> 11.8%	21%	28%
	Total	100%	100%
% of pupils underweight: ¹	up to 5.1%	58%	28%
	5.2 – 10.1%	21%	22%
	10.2 – 15.3%	13%	28%
	> 15.3%	8%	22%
	Total	100%	100%

Source: School survey 2006.

References

- Armar-Klemesu, M. (2000), Urban agriculture and food security, nutrition and health. In: N. Bakker *et al.*, eds., *Growing cities, growing food. Urban agriculture on the policy agenda*, pp. 99-118. Feldafing (Germany): Deutsche Stiftung für internationale Entwicklung (DSE).
- Bakker, N., M. Dubbeling, S. Gündel, U. Sabel-Koschella & H. de Zeeuw (2000), *Growing Cities, Growing Food. Urban agriculture on the policy agenda*. Feldafing (Germany): Deutsche Stiftung für internationale Entwicklung (DSE).
- Daily Nation (2005), Schools in novel farm project (accessed at <http://www.nationmedia.com/dailynation/printpage.asp?newsid=46980> on April 13, 2005).
- Dongus, S. (2000), *Vegetable production on open spaces in Dar es Salaam – Spatial changes from 1992 to 1999*. Dar es Salaam: Urban Vegetable Promotion Project.
- Foeken, D. (2006), *“To subsidise my income” : Urban farming in an East-African town*. Leiden: Brill.
- Foeken, D. & S.O. Owuor (2000), *Urban farmers in Nakuru, Kenya*. Leiden / Nairobi: African Studies Centre / Centre for Urban Research, ASC Working Paper 45.
- Foeken, D. & S.O. Owuor (2002), *Crop cultivation in Nakuru town, Kenya: Practice and potential*. Leiden: African Studies Centre, ASC Working Paper 50.
- Gibson, R.S. (1990), *Principles of nutritional assessment*. New York: Oxford University Press.
- Hijazi, S.S. & D. Abdulatif (1986), The nutritional impact of a school feeding programme in Mafrq, Jordan. *Journal of Tropical Paediatrics* 32(4): 174-180.
- Kenya, Republic of (2001), *Economic Survey 2001*. Nairobi: Government Printer.
- Levinger, B. (1986), *School-feeding programs in developing countries: An analysis of actual and potential impact*. Washington DC: Bureau for Food and Voluntary Aid.
- Levinger, B. (1996), *Nutrition, health and education for all*. Newton, MA: Education Development Center (accessed at <http://www.edc.org/GLG/NHEA> on January 9, 2003).
- MCN (1999), *Strategic Nakuru Structure Plan. Action plan for sustainable urban development of Nakuru town and its environs*. Nakuru: Municipal Council of Nakuru (Final draft).
- Médecins Sans Frontières (1995), *Nutrition guidelines – First edition*. Paris: Médecins Sans Frontières.
- Meme, M.M. (1996), *Nutrient intake and nutritional status of children in a school with and without a feeding programme in Nyambene District, Kenya*. Nairobi: University of Nairobi, Applied Nutrition Programme, MSc thesis.
- Meme, M.M., W. Kogi-Makau, N.M. Muroki & R.K. Mwadime (1998), Energy and protein intake and nutritional status of primary school children 5 to 10 years of age in schools with and without feeding programmes in Nyambene District, Kenya. *Food and Nutrition Bulletin* 19(4).
- Moock, P. & L Leslie, J. (1986), Childhood malnutrition and schooling in the Terai region of Nepal. *Journal of Development Economics* 20(1): 33-52.
- Mwago, G. (2000), SENVINET, Nakuru, personal communication, 13-09-2000.
- Mwangi, A.M. (1995), *The role of urban agriculture in food security in low-income areas in Nairobi, Kenya*. Leiden: African Studies Centre.
- Mwihaki, A. (2000), coordinator SENVINET, written communication.
- Nugent, R. (2000), The impact of urban agriculture on the household and local economies. In: N. Bakker *et al.*, eds., *Growing cities, growing food. Urban agriculture on the policy agenda*, pp. 67-98. Feldafing (Germany): Deutsche Stiftung für internationale Entwicklung (DSE).
- Obudho, R.A. & D. Foeken (1999), *Urban agriculture. A bibliographical survey*. Leiden / Nairobi: African Studies Centre / Centre for Urban Research, ASC Research Report 58.
- Odera, C. (forthcoming), *The implications of urban school farming on food security and nutrition: A study in Nakuru town*. Nairobi: University of Nairobi, Unit of Applied Human Nutrition (MSc thesis).
- Pieters, J.J.L., J.P.C. de Moel, O. van Steenberghe & W.J.M. van der Hoeven (1977), Effects of school feeding on growth of children in Kirinyaga District, Kenya. *East African Medical Journal* 54: 624-29.
- Pollitt, E. (1990), *Malnutrition and infection in the classroom*. Paris: UNESCO.
- Potutan, G.E., E.M. Imam, R.J. Holmer & W.H. Schnitzler (1999), *School gardens of Cagayan de Oro contributing to food security. Initial observations*.
- Rajalakshmi, R. & K. Vanaja (1967), Chemical and biological evaluation of the effects of fermentation on the nutritive value of foods prepared from rice and grains. *British Journal of Nutrition* 21:467

- Simeon, D.T. & S.M. Grantham-McGregor (1989), Effects of missing breakfast on the cognitive function of school children of differing nutritional status. *American Journal of Clinical Nutrition* 49: 646-653.
- Smit, J., A. Ratta & J. Nasr (1996), *Urban agriculture: Food, jobs and sustainable cities*. New York: United Nations Development Programme (UNDP).
- Tuts, R. (1998), Localizing Agenda 21 in small cities in Kenya, Morocco and Vietnam. *Environment and Urbanization*, 10(2), 175-189.
- UNSO/NHSCP (1986), How to weigh and measure children: Assessing the nutritional status of young children in household surveys. New York: United Nations Statistical Office/National Household Survey Capability Programme.
- VOA News (2003). Kenya's schools try to accommodate free education. Nairobi, Kenya, Feb. 3 2003. (accessed at www.insnews.org/world/focus/2003/02/kenya.free.education.htm on March 19, 2003)
- WFP (2002), Internet site: www.wfp.org/aboutwfp/introduction/school_feeding.html (accessed on March 19, 2003)
- WHO (1983), *Measuring change in nutritional status: Guidelines for assessing the nutritional impact of supplementary feeding programmes for vulnerable groups*. Geneva: World Health Organisation.
- Wilson, A. (1981), Longitudinal analysis of diet, physical growth, verbal development and school performance. In J. Balderston, A. Wilson, M. Freire & M. Simonen, eds., *Malnourished children of the rural poor*, pp. 39-79. Boston: Auburn House Publishing Company.

ASC Working Papers

- | | | |
|---------|--|---|
| Vol. 1 | Laurens van der Laan
1980 | Modern inland transport and the European trading firms in colonial West Africa |
| Vol. 2 | Klaas de Jonge
1980 | Relations paysans, pêcheurs, capitalisme, état. Une étude d'une lutte de classe en Casamance (Sud Sénégal)
<i>out of print</i> |
| Vol. 3 | Gerti Hesseling
1981 | Etat et langue en Afrique. Esquisse d'une étude juridique comparative |
| Vol. 4 | Els van Rouveroy van Nieuwaal-Baerends & Emile van Rouveroy van Nieuwaal
1981 | Conciliation et la qualité des relations sociales chez les Anufim du NordTogo en Afrique de l'Ouest
<i>out of print</i> |
| Vol. 5 | Piet Konings
1981 | Peasantry and state in Ghana. The example of the Veaa Irrigation Project in the Upper Region of Ghana
<i>out of print</i> |
| Vol. 6 | C.A. Muntjewerff
1982 | The producers' price system and the coffee and cocoa trade at village level in West Africa |
| Vol. 7 | C.A. Muntjewerff
1982 | Produce marketing cooperatives in West Africa |
| Vol. 8 | Emile van Rouveroy van Nieuwaal & Els van Rouveroy van Nieuwaal-Baerends
1982 | La Parcelle du Gendre comploteur. Manières coutumières et modernes d'acquérir des droits sur la terre, à N'zara (Nord Togo) |
| Vol. 9 | B. Merx
1985 | Zonder bloed geen vliegen
<i>out of print</i> |
| Vol. 10 | Laurens van der Laan
1987 | Cameroon's main marketing board: History and scope of the ONCPB |
| Vol. 11 | Laurens van der Laan
1988 | Cocoa and coffee buying in Cameroon: The role of the marketing board in the South-West and North-West Provinces, 1978-1987 |
| Vol. 12 | Cyprian F. Fisiy
1990 | Palm tree justice in the Bertoua Court of Appeal: The witchcraft cases. |
| Vol. 13 | Laurens van der Laan & Wim van Haaren | African marketing boards under structural adjustment: The experience of Sub-Saharan Africa during the 1980s. |
| Vol. 14 | Rob Buijtenhuijs
1991 | The revolutionary potential of African peasantries: Some tentative remarks. |

- Vol. 15 Deborah F. Bryceson & John Howe
1993 Rural household transport in Africa: Reducing the burden on women?
- Vol. 16 Deborah F. Bryceson
1993 Easing rural women's working day in Sub-Saharan Africa.
- Vol. 17 Rob Buijtenhuijs & Elly Rijnierse
1993 Democrativering in Afrika ten zuiden van de Sahara (1989-1992). Deel 1: Een becommentarieerd overzicht van de literatuur. Deel 2: Onderzoekscapaciteiten in Afrika en in het Westen.
out of print
- Vol. 18 Nina Tellegen
1993 Rural employment in Sub-Saharan Africa. A bibliography.
- Vol. 19 Deborah F. Bryceson
1993 De-Agrarianization and rural employment generation in Sub-Saharan Africa: Process and prospects.
- Vol. 20 Deborah F. Bryceson & Corina van der Laan
1994 De-agrarianization in Africa. Proceedings of the "De-agrarianization and Rural Employment" workshop held at the Afrika-Studiecentrum, Leiden, May 1994
- Vol. 21 Deborah F. Bryceson & M. McCall
1994 Lightening the load: Women's labour and appropriate rural techology in Sub-Saharan Africa.
- Vol. 22 Tjalling Dijkstra
1995 Food trade and urbanization in Sub-Saharan Africa: From the early Stone Age to the structural adjustment era.
- Vol. 23 Patricia Paravano
1997 Working for the future: Elite women's strategies in Brazzaville.
- Vol. 24 R.J.A. Berkvens
1997 Backing two horses: Interaction of agricultural and non-agricultural household activities in a Zimbabwean communal area.
- Vol. 25 M. Demeke
1997 Rural non-farm activities in impoverished agricultural communities: The case of North Shoa, Ethiopia.
- Vol. 26 C.G. Mung'ong'o
1998 Coming full circle: Agriculture, non-farm activities and the resurgence of out-migration in Njombe District, Tanzania.
- Vol. 27 Ndalakwa F. Madulu
1998 Changing lifestyles in farming societies of Sukumaland: Kwimba District, Tanzania.
- Vol. 28 George Jambiya
1998 The dynamics of population, land scarcity, agriculture and non-agricultural activities: West Usambara Mountains, Lushoto District, Tanzania.
- Vol. 29 Davis Mwamfupe
1998 Changing village land, labour and livelihoods: Rungwe and Kyela Districts, Tanzania.
- Vol. 30 Dick Foeken & Alice M. Mwangi
1998 Farming in the City of Nairobi.

- Vol. 31 Wijnand Klaver & Robert K.N. Mwadime
1998 Food consumption and nutrition in the Kenya Coast.
- Vol. 32 C. Manona
1999 De-agrarianisation and the urbanisation of a rural economy: Agrarian patterns in Melani village in the Eastern Cape.
- Vol. 33 P. McAllister
1999 Agriculture an co-operative labour in Shixini, Transkei, South Africa.
- Vol. 34 L. Bank & L. Qambata
1999 No visible means of subsistence: Rural livelihoods, gender and social change in Mooiplaas, Eastern Cape, 1950-1998.
- Vol. 35 Deborah F. Bryceson
1999 African rural labour, income diversification and livelihood approaches: A long-term development perspective.
- Vol. 36 Elly Rijnierse
1999 The politics of survival. Towards a global, long-term and reflexive interpretation of the African contemporary experience.
- Vol. 37 Barth Chukwuezi
1999 De-agrarianisation and rural employment in Igboland, South-eastern Nigeria.
- Vol. 38 Mohammed-Bello Yunusa
1999 Not farms alone: A study of rural livelihoods in the Middle Belt of Nigeria.
- Vol. 39 Mohammed A. Iliya
1999 Income diversification in the semi-arid zone of Nigeria: A study of Gigane, Sokoto, North-west Nigeria.
- Vol. 40 Kate Meagher
1999 If the drumming changes, the dance also changes: De-agrarianisation and rural non-farm employment in the Nigerian Savanna.
- Vol. 41 Jon Abbink
1999 The total Somali clan genealogy: A preliminary sketch.
- Vol. 42 Abdul R. Mustapha
1999 Cocoa farming and income diversification in South-western Nigeria.
- Vol. 43 Deborah F. Bryceson
1999 Sub-Saharan Africa betwixt and between. Rural livelihood practices and policies.
- Vol. 44 A. van Vuuren
2000 Female-headed households: Their survival strategies in Tanzania.
- Vol. 45 Dick Foeken & Samuel O. Owuor
2000 Urban farmers in Nakuru, Kenya.
- Vol. 46 Poul Ove Pedersen
2001 Busy work or real business: Revaluing the role of non-agricultural activities in African rural development.
- Vol. 47 Tjalling Dijkstra
2001 Export diversification in Uganda: Developments in non-traditional agricultural exports.
- Vol. 48 Boureima Alpha Gado
2001 Variations climatiques, insécurité alimentaire et stratégies paysannes.

Vol. 49	Rijk van Dijk 2002	Localising anxieties: Ghanaian and Malawian immigrants, rising xenophobia, and social capital in Botswana.
Vol. 50	Dick Foeken, Samuel O. Owuor & Wijnand Klaver 2002	Crop cultivation in Nakuru town, Kenya: Practice and potential.
Vol. 51	Samuel O. Owuor 2003	Rural livelihood sources for urban households A study of Nakuru town, Kenya
Vol. 52	Jan Abbink 2003	A Bibliography on Christianity in Ethiopia
Vol. 53	Henk Meilink 2003	Structural Adjustment Programmes on the African continent. The theoretical foundations of IMF/World Bank reform policies
Vol. 54	Chibuike C. Uche & Ogbonnaya C. Uche 2004	Oil and the Politics of Revenue Allocation in Nigeria
Vol. 55	Jan Abbink 2004	Reconstructing Southern Sudan in the post-war era: Challenges and prospects of 'Quick Impact Programmes'
Vol. 56	Samuel M. Kariuki 2004	Creating the black commercial farmers in South Africa
Vol. 57	Marcel M.E.M. Rutten 2004	Partnerships in community-based ecotourism projects: Experiences from the Maasai region, Kenya
Vol. 58	Samuel M. Kariuki 2004	Failing to learn from failed programmes? South Africa's Communal Land Rights Act (CLRA 2004)
Vol. 59	Samuel M. Kariuki 2004	Can negotiated land reforms deliver? A case of Kenya's, South Africa's and Zimbabwe's land reform policy Debates
Vol. 60	Jan-Bart Gewald 2005	Learning to wage and win wars in Africa: A provisional history of German military activity in Congo, Tanzania, China and Namibia
Vol. 61	Jan-Bart Gewald 2005	The impact of motor-vehicles in Africa in the twentieth century: Towards a socio-historical case study
Vol. 62	John Sender, Christopher Cramer & Carlos Oya 2005	Unequal prospects: Disparities in the quantity and quality of labour supply in sub-Saharan Africa
Vol. 63	Jan-Bart Gewald 2005	Colonial warfare: Hehe and World War One, the wars besides Maji Maji in south-western Tanzania
Vol. 64	Abel Ezeoha & Chibuike Uche 2005	South Africa, NEPAD and the African Renaissance
Vol. 65	Dick Foeken 2005	Urban agriculture in East Africa as a tool for poverty reduction: A legal and policy dilemma?
Vol. 66	Marcel Rutten 2005	Shallow wells: A sustainable and inexpensive alternative to boreholes in Kenya

Vol. 67	Judith van de Looy 2006	Africa and China: A strategic partnership?
Vol. 68	Tabona Shoko 2006	"My bones shall rise again": War veterans, spirits and land reform in Zimbabwe
Vol. 69	Lwazi Siyabonga Lushaba 2006	Development as modernity, modernity as development
Vol. 70	John Sender & Carlos Oya 2006	Divorced, separated and widowed female workers in rural Mozambique
Vol. 71	Wale Adebaniwi 2007	Necrophilia and elite politics: The case of Nigeria
Vol. 72	Sabelo J. Ndlovu-Gatsheni 2007	Tracking the historical roots of post-apartheid citizenship problems: The native club, restless natives, panicking settlers and the politics of nativism in South Africa
Vol. 73	Sabelo J. Ndlovu-Gatsheni 2007	Giving Africa voice within global governance: Oral history, human rights and the United Nations (UN) Human Rights Council
Vol. 74	Jan-Bart Gewald 2007	Transport transforming society: Towards a history of transport in Zambia, 1890-1930
Vol. 75	Jan-Bart Gewald 2007	Researching and writing in the twilight of an imagined quest: Anthropology in Northern Rhodesia 1930-1960

Recent Working Papers are also online available on our website
<http://www.ascleiden.nl/Publications/WorkingPapers.aspx>

Working Papers are free of charge if they are for personal use. For bookshops we have to charge € 5,- per Working Paper, shipping costs not included. They can be ordered from:

Ms Marieke van Winden, PR coordinator
 Telephone: +31 (0)71 5273358
 E-mail: winden@ascleiden.nl

