

‘New learning in old organisations’: children’s participation in a school-based nutrition project in western Kenya

**Charles Ogoye-Ndegwa, Dominic Abudho,
and Jens Aagaard-Hansen**

Introduction

Chambers (1983, 1997) has given numerous examples of the ways in which underprivileged segments of populations worldwide can be empowered to take an active part in the development of their own communities. Among children, the Child-to-Child Approach (CtC) has been implemented in several countries around the world, representing an innovative and action-oriented way of encouraging the active participation of children in the dissemination of information on health-related issues. In this approach, children are at centre stage, either through caring for their younger brothers and sisters or through working among children in their own age groups to improve health practices in the school, the home, and the community. In a worldwide network of over 60 countries, CtC focuses on health education and primary healthcare (Bailey *et al.* 1992). However, although many CtC interventions have been implemented throughout the world, few researchers have made any critical studies. Pridmore (1997) studied a CtC programme in Botswana and Onyango-Ouma (2001) conducted extensive research within our study area in western Kenya on the potential of children as health-change agents based on a CtC intervention. Meinert (2001) explored the interaction between schooling and children’s roles as resource people in their homesteads in eastern Uganda.

Recently, scholars have focused on children’s ‘action competence’ as a critical element in health education in particular and life skills in general (Jensen and Schnack 1994a). The concept of ‘action competence’ builds on the premise that children can influence their surroundings, thereby partly changing their own lives, and partly influencing their community in a positive direction. This potential can be realised by empowering children to take charge of their own

health and that of the entire community (Wals 1994). (For a more theoretical approach to the agency of children, see James *et al.* (1998)).

In 2000 it was estimated that sub-clinical vitamin A deficiency (serum retinol <0.70 m mol/l) affected up to 250 million pre-school children, and iron deficiency and its anaemia affected more than 3.5 billion (all age groups) in the world (Sub-Committee on Nutrition 2000:v). This is in accordance with research findings in western Kenya, where 62 per cent of pre-school children and 24 per cent of school children were found to have sub-clinical vitamin A deficiency (Friis *et al.* 1997).¹

Measures such as diet diversification, supplementation, and fortification are needed to alleviate these severe problems, although 'strategies to increase the income of the poor are the most sustainable means of improving the household food security' (Sub-Committee on Nutrition 1997:84–87). As a measure towards increasing the amount of micronutrient-rich foods, Leemon and Samman (1998:24) recommend the application of the food-based systems approach, which involves 'the development of a community garden and small household plots, containing many indigenous plant species, as a practical and a sustainable solution'. They go on to argue that 'a food system is dynamic and has the potential to influence a community's consumption of micronutrient-rich foods. This intervention is more economically and culturally feasible, and is a more sustainable way of improving micronutrient status' (*ibid.*:8). The Committee on Micronutrient Deficiencies (1998) states that: 'experience to date has shown that "how" an intervention is implemented may be as important, or in some cases more important, than "what" is implemented'.²

The action-research project³ reported here has a two-fold purpose: to explore ways of empowering Kenyan primary school pupils in order to make them change agents for community development and thereby transform traditional primary schools into active resource centres for community change; and to (re-)introduce locally available, traditional vegetables⁴ in teaching about agriculture at the primary school level with a view to improving the food and nutrition security in a rural community in Kenya. The article will focus on the processes of the first part of the project since the nutritional aspects are described elsewhere (Ogoye-Ndegwa and Aagaard-Hansen forthcoming).

Materials and methods

Study area

The study was conducted in Bondo District, Nyanza Province in western Kenya, in a Luo community along the shores of Lake Victoria. The main rainfall season is between February and June, when the land is cultivated, and there is usually a shorter period of rain in October and November. The Lake Victoria basin receives an average annual rainfall of 750–1000mm. The area experiences temperatures varying between 14 and 30° C and the altitude is between 1140 and 1300m. The landscape is characterised by dispersed homesteads intersected by bush and the soil is mostly black cotton soil with rocky areas in between.

Study population

The Luo are among the largest ethnic groups in Kenya – estimated to number about three million. The main occupation of the Luo is subsistence farming, with maize, sorghum, millet, and cassava as the staple crops. The Luo, who were originally predominantly pastoralists, still keep a substantial number of goats, cows, and poultry, and sheep and donkeys are also common. In addition, petty trade, fishing, and remittances from migrant workers supplement the household economy. The population is far from prosperous and is consequently vulnerable to drought periods and decline in agricultural produce and cash income. The majority belongs either to the Anglican Church of Kenya, the Roman Catholic Church, or the Seventh Day Adventists, although there are several smaller sects as well.

Educational system

All children in Kenya are supposed to go to primary school for eight years (plus an optional nursery class). Teachers' salaries are paid by the government, but all other expenses (buildings, desks, uniforms, chalk, books, etc.) are paid for by the parents. Although the fees are moderate from a Northern perspective (approximately US\$10 per annum), the cost still means that some children don't attend school.

Teaching methods are traditional: 'Classroom activities are ritualistic and cyclical following a laid out timetable ... Teaching methods are mostly didactic with pupils on the receiving end and the knowledge hierarchy is quite clear' (Onyango-Ouma 2001:132). Discipline is strict: ' ... the first thing that strikes a visitor in rural

primary schools is the rate at which teachers use corporal punishment as a mode of punishment for various mistakes. Pupils in my study schools got corporal punishment for such offences as not running when summoned by a teacher, coming to school late, failure to answer a question during a lesson' (Onyango-Ouma 2001:28).

Methods of data collection

The researchers conducted semi-structured interviews and 'field walks' with 27 key informants, elderly people who knew about traditional vegetables. Together with input from the research pupils, these data formed the basis for the compilation of an inventory of traditional vegetables.

During the time when the school gardens were tended, pupils wrote so-called 'plot diaries'. They were provided with books and pens, and trained field assistants (secondary school leavers) later translated what they had recorded in the local language (*Dholuo*) into English. The research pupils recorded data for each traditional vegetable on areas such as the length of time each vegetable takes to germinate, resistance to infections, drought resilience, maturation duration, and difficulties in general care (e.g. pruning and weeding).

Over a two-week period, field assistants recorded dietary intake among 24 pupils based on structured question guides. The exercise was conducted during a rainy month (May 1999) as well as during the dry season (March 2000). The children were purposively selected from Classes 4 to 7 in the school ensuring equal distribution in terms of gender, age, and geography. Data were collected daily based on 24-hour recall.

Based on his own observation, the teacher made research notes on the pupils' competencies and learning abilities with regard to classroom learning of agriculture and practical work in the school garden as well as in participatory research.

In addition, market surveillance was conducted, involving repeated visits to markets within and around the community where traditional vegetables are for sale. The markets were monitored during a full year, covering both the wet and the dry seasons. Interviews were also conducted with hawkers who went from house to house selling traditional vegetables. During two sessions of community interaction ('vegetable fairs'), data were collected regarding palatability of the vegetables and various methods of preparation.

Sequence of events

The study involved the researchers, the local primary school, and the community as part of a stepwise action research-cum-development project. We believe that each of these steps was essential for the success of the project.

Initial planning

The idea was originally conceived by the researchers, who at that time had already been conducting research in the community for three years. Thus, a close link between the researchers and the community had already been established and a relatively reliable picture of community needs as well as its development potential had been identified. The researchers approached the school administration of the local Mbeka Primary School (MPS) explaining the objectives and scope of the study. The project was endorsed and the headmaster appointed a teacher (based on his keen interest in agriculture) who has subsequently participated in the project planning and implementation.⁵ Then, informed consent was sought from the Parents and Teachers Association (PTA) committee, which also endorsed the project. Furthermore, the local educational authorities at division and district level were kept informed and strongly supported the project throughout. The role of the headmaster as a bridge to the community in societies where the adherence to formal rules is valued should not be underestimated. In this case, the headmaster showed a lot of personal interest and allowed the Class 6 pupils to be exempted from normal school duties in order to give them time to concentrate on their school gardens.

Teacher training

On two different occasions the project teacher was trained on horticulture farming at 'Care for the Earth' (CftE), a local agricultural self-help project carrying out training and consultancy on organic farming systems involving the management and conservation of natural resources. The overall objective of CftE is to increase food-production capabilities, especially among low-income, small-scale farmers in a bid to reduce nutrition-related diseases among children. The training covered mainly courses on horticulture, traditional vegetables, inter-cropping, manure production, and poultry, but specific topics such as soil management, seed harvesting, and storage, as well as how to apply manure using locally available materials, were also taught.⁶ An important topic was pest behaviour and pest

management using naturally available, easily obtained, and affordable plant leaves and bark. Plants usually used as pest sprays are pounded and mixed in water. Given the high costs of commercial pesticides, these techniques reduce costs greatly.

The teacher was not given any formal training on participatory teaching methods. Nevertheless, the school-based horticulture activities developed in a mode of dialogue between the teacher and the pupils. Primarily we found that the practical mode of teaching gave the teacher a chance to realise the pupils' potential. Whether there was an element of the teacher's personality, the influence of the researchers, or a combination of the two, it is difficult to say. However, with hindsight we realise that this is a crucial element both in selecting and training the teachers. Apart from the project's support for the training (including payment of a per diem during the course), no financial incentives were given. However, the training (for which a certificate was provided) served as a strong incentive in its own right, partly because of the new knowledge gained and partly because it was a rare chance for in-service training, which can facilitate career development.

Recruitment of children

According to the Kenyan Primary School syllabus, agriculture is taught as a subject in grades 4 to 8.⁷ Class 6 was chosen as the research class because this is the stage where children have already been exposed to most horticulture-related topics. The selection of pupils, who are referred to as 'the research pupils', was based on their previous year's examination performance, particularly in agriculture, and on their outspokenness, inquisitiveness, and willingness and ability to record research data neatly. Based on information about the project, the children were then asked whether they would like to participate.⁸

The 'research pupils' were responsible for part of the data collection such as the daily recordings in each respective plot and also market surveillance. This selection has been repeated at the start of each school year when the new Class 6 takes over the project. The number of research pupils varied from 14 (in 1998) to 18 (in 1999), with an equal balance of boys and girls. However, there was no sharp distinction between participants and non-participants. This was partly because all the Class 6 pupils were teaching other classes within MPS and beyond, and partly because, as the project developed over the years, new pupils reached Class 6 while those going on to Classes 7 and 8 still had the skills and some even expressed nostalgia about the fact that new pupils had taken centre stage.⁹

Data collection

Initially, a list of all the 72 locally available, traditional vegetables was constructed. Market surveillance was initiated and continued for more than a year (1999–2000). Data on dietary intake recall based on structured interviews were collected during two sessions. In addition the various school-based activities and the community-dissemination process have been documented throughout.

Agriculture teaching and school gardening

According to the way agriculture teaching in Kenyan primary schools is conceived, there should be a practical as well as a theoretical element. In real life, however, the teaching is mostly theory- and classroom-based. Based on the existing inventory of traditional vegetables derived from interviews with key informants, a selection of traditional vegetables was made by the pupils in collaboration with the teachers and the researchers. The school garden was prepared and fenced and compost manure was prepared using locally available materials. The garden was divided into several small plots in which different vegetables were cultivated. Some pupils were assigned to each plot, and a research pupil made daily records of all the activities in that particular plot on behalf of the other pupils. After the training in methods for organic horticulture farming at 'Care for the Earth', the agriculture teacher was a facilitator for the Class 6 pupils. Among the most important points was the introduction of the new methods for production of manure based on locally available materials. During the four years, the horticultural activities have been carried out intermittently, depending on periods of school holidays and lack of rainfall. The project provided the stationery and at a later stage a few farm implements, and once a year it facilitated the Class 6 pupils' visit to CftE.

Community involvement

Two 'vegetable fairs' (1998 and 1999) were organised in which the Class 6 pupils acted as hosts to the other pupils from MPS, the teachers, parents, PTA committee members, as well as teachers' and pupils' representatives from neighbouring schools, members of the community, area educational officers, and other local opinion leaders. These were days in which the vegetables were cooked and eaten in the school. The fairs served a double purpose: to give feedback to the community and to collect more data. In terms of community feedback, visitors were encouraged to change their own attitudes towards

increased consumption, while the fairs provided opportunities to collect additional information on palatability ranking and how best to cook specific traditional vegetables. In addition to the fairs, two community meetings were held in 1999 and 2000, to which about 70 key people were invited in order to tell them about the study findings and give feedback.

During the school year 2000,¹⁰ Class 6 was divided into two streams, which meant that an additional teacher was introduced to the project. The emphasis is now on seed production and dissemination of knowledge to the community. In this process, the research project has chosen the establishment of home-based gardens with traditional vegetables as an indicator of community dissemination, irrespective of whether they are made by the pupils or other community members. The fact that there are now two Classes 6 at MPS has introduced an element of competition regarding the success of dissemination.

Several meetings between the pupils, the teacher(s), and the researchers were held over the years to monitor the whole process jointly and identify future strategies.

Further expansion

In 2001 there was an encouraging development pointing to the sustainability of the project. In parallel to the ongoing horticultural activities at MPS, three other schools in the vicinity showed interest in becoming part of the project. Consequently, a new group of teachers was sent for training at CftE and the activities are now in various stages of being implemented in the three new schools. An informal network has been established ensuring communication between the now eight horticulture teachers, and supervision by CftE resource staff was planned for 2002.¹¹

Results

Horticultural aspects

A total of 72 different traditional vegetables were identified, the majority of which (57) are believed to be uncultivable. Extensive data have been collected on procurement, preparation, and medicinal uses, and related perceptions and practices will be described elsewhere (Ogoye-Ndegwa and Aagaard-Hansen forthcoming). These data served as the starting point for the school- and community-based activities that are described in this article.

In total, 19 different species of traditional vegetables have been cultivated in the school gardens. Of these, seven were perceived as cultivable, whereas 12 had never been cultivated before. All 72 traditional vegetables thrive during the wet season (February to June) even though they are not all consumed during this time of abundance. In contrast, the dry season (September to January) presents a limited variety of 38 different species. Data from the food-recall activities indicate high consumption of traditional vegetables during the rainy period and hardly any during the dry season. It should be borne in mind that the rainy season is usually 'the hungry period' when the granaries are empty and the new harvest is not yet ready, so the availability of the many traditional vegetables is timely.

There were 13 traditional vegetables that were commercially available. Seasonality was a strong determining factor in the availability of traditional vegetables in the local markets. Since the vegetables are available only in small quantities during the dry season, none of them are sold in the local markets, and community members procure them only for direct household consumption.

The data showed that the use of vegetables was declining rapidly and it was mainly the community's elders who had the knowledge about the procurement and utilisation of herbs.¹² However, the data from the dietary intake recall showed a clear trend that the consumption of traditional herbs was higher in the households of the Class 6 pupils who had been exposed to the project.

There are indications that several of these traditional vegetables contain large quantities of micronutrients such as iron and vitamin A (FAO 1968). Botanical and biochemical studies are currently looking further into these issues. However, the specific nutritional aspects are not the main focus of the present article.

Participatory aspects

Pupil involvement

Usually the relationship between pupils and teachers is characterised by large differences in status and power. Teachers are looked up to with a combination of reverence (because of their knowledge) and fear (because of their authority which is often expressed in corporal punishment). After the inception of the project, the pupils were becoming more open and inquisitive, as they could challenge the teachers in various discussions – something that never happened before.

The action-oriented modes of learning took the pupils away from the monotonous, rote-learning of the classroom and gave them motivation and satisfaction since they were actively involved in community development. The agriculture teacher made the following observation:

The research pupils' performance has been commendable and this is attributable to their active participation in the school gardens; and partly because they have always acted as 'knowledgeable persons' regarding all aspects of the project at school. Agriculture teaching has been made more realistic and easier for the agriculture teachers than ever before. The open dialogue and empowering of the pupils as really 'knowledgeable' made them speak more freely and engage in lively discussions.

The teacher noted that pupils were livelier to teach, that they were more active and outspoken after the introduction of the project, and that their participation in class was much enhanced. From the practical work they were engaged in, most of them became more familiar with concepts in agriculture than before:

The idea of having a school garden made the classroom more lively as most things became so vivid and practical to the pupils. The classroom teaching has greatly been more meaningful through demonstrations in the garden. This means that even the less bright pupils are also given a chance to prove their worth in the practical lessons that went alongside theoretical learning. This greatly boosts their motivation.

From the academic point of view both girls and boys did well. However, girls tended to do better and showed more commitment than the boys, for example working during odd hours and watering during drought. There is a cultural dimension to this. Traditionally and even today vegetable cultivation, gathering, and cooking are seen as exclusively a female domain and males who venture into it are pejoratively regarded as 'women'. So the significant issue here is that the boys participated at all.

The community's involvement

During the vegetable fairs, traditional vegetables were tasted and compared and the guests engaged in lively discussions regarding the various dishes that had been prepared by the pupils. This formed the basis of the data collection on palatability ranking as well as presentation as a means to raise awareness. In line with the cultural

perception that cultivating vegetables falls within the female domain, most informants were women. Community members expressed amazement that 72 varieties of local vegetables were locally available – an unknown and under-used resource, which was often thrown away when weeding the ‘real’ crops.

Community members expressed their satisfaction that for the first time in their lives they realised that education should not be divorced from community participation, and that children have a significant role to play. As one parent stated:

I have never known what my child learns at school until he came to teach us and demonstrate to our neighbours how to cultivate these traditional vegetables we have lived with for a long time and assumed uncultivable.

The mere fact that meetings were convened where vegetables were the main focus and no meat or staple food was served to go with them, was seen as extraordinary. According to local attitudes, vegetables compare very unfavourably with other food items such as meat or fish. Among the Luo, it is usually considered undignified to serve only vegetables to a visitor. The Area Educational Officer (AEO) who attended one of the vegetable fairs remarked:

I had a lot of commitment and meetings to attend, but I could not fail to attend this day. It is the first time in my lifetime to be invited to eat vegetables. I wouldn't have come if it were a feast on beef, chicken, etc.

Class 6 pupils were looked upon as knowledge holders and became instructors to pupils from other (and even higher) classes and guests from other schools, who occasionally visited the MPS. In one of the neighbouring schools, which had been exposed to the teaching of the study pupils, school gardens were introduced in which traditional vegetables were grown and sold to the local community. Funds collected were used on school building and other projects.

The new role of the research pupils was clearly shown when the District Educational Officer of Bondo District visited the study school in 1999 specifically to see the horticulture project. It should be borne in mind that, seen from the ‘grassroots perspective’ of an ordinary primary school, the DEO is a very powerful person who, on rare visits, mostly inspects and looks out for faults that are commented on mercilessly. So the scene of the DEO walking around with the Class 6 pupils and learning from them was rather extraordinary. The headmaster expressed it thus:

I thank Class 6 for their role in the school, always acting as a bridge between the school and the community. More so, we are very proud that on several occasions we receive visitors from our Educational Offices who come to see what they are doing in the project, and even hosting other schools on behalf of the whole school.

We see these statements as indications that the horticulture activities did not take place in isolation, but influenced educational opinion leaders and thereby the school in a more general sense.

As a means of reaching a wider community, the pupils continue to cultivate traditional vegetables in their individual kitchen gardens and in the school to provide the seeds and offer demonstrations to community members on gardening, how to use manure, and other practical aspects of cultivating the herbs. The Class 6 pupils have played a key role in this respect. A girl who was one of the research pupils had this to say:

When I started preparing my plot, my mother used to quarrel me that I was wasting time, but now ugali can be cooked in our house even before vegetables are looked for.

What is implicit here is that, unlike in the past, it is now easy to obtain vegetables within the homestead so that they do not need to be looked for before *ugali* (the staple food of the Luo prepared from maize and sometimes sorghum flour) can be cooked.

The agriculture teachers continue to act as external advisers and to supervise the process. They visit pupils in their homes and offer them advice wherever necessary. This kind of follow-up motivates and guides the pupils and increases acceptance within the community. Pupils continue to record the entire process of community dissemination – for example, the kind of information they give to community members, problems as seen from community members' perspective, acceptability to the community, problems they encounter in the process of dissemination, etc. The data have shown that kitchen gardens have been introduced in many homesteads thanks to the efforts of the horticulture classes.

Needless to say, the project has faced major problems as well, mainly of a practical nature. Rainfall is a crucial factor, and the unpredictability of the amount as well as the time at which it may come make farming an uncertain way of subsistence. There are no irrigation schemes in the area. Water has to be fetched from the lakeshore a few kilometres away and carried either by the pupils

themselves or by donkey. Thus, the watering of a school garden of about 1000m² during an extended dry spell can pose a major challenge to the participating pupils, not least during the holidays when the school is deserted and other children are playing. This has had a negative influence by discouraging the pupils and forcing them to start afresh.

Another practical problem was the interference of animals and outsiders destroying the plots. Fencing of the school plots was needed in order to keep out goats and cows. However, the fence constantly had to be maintained as some people in the neighbourhood snatched dry wood from the fence to use it for fuel.

Conclusion

During a period of about four years we have gathered experiences from the action-research project described here, which has involved a primary school, community members, and researchers. We believe that a number of practical lessons can be learnt from the study:

- The importance of having good knowledge of the community prior to introducing the project cannot be overemphasised. This enables practitioners to address the actual needs of the community and to operate in a way that is compatible with local structures of power and status. While this may sound a banal truism, it should always be borne in mind.
- Careful selection of potential change agents (in this case the Class 6 research pupils and the teacher) based on thoroughly considered criteria is significant.
- Involvement of all relevant key players from the start (e.g. the PTA committee, the education authorities, opinion leaders of the community, and parents) broadens the ownership of the project and increases the likelihood of successful dissemination of the results.
- The delegation to the pupils of responsibility for key project activities (e.g. cultivation, data collection, and teaching) empowered them to play a more active role, which increased their personal learning and enabled them to act as development change agents.
- Only very limited financial input is needed from the outside provided that it is appropriate and comes at the right time (in this case project funding for teacher training, pupils visits to CftE, stationery, and a few farm implements).

- The combination of research (to provide relevant new knowledge and to document ongoing activities in a systematic way) and community development (to apply the research findings and introduce sustainable change) has many advantages.

Provided that these steps are taken, human resources (i.e. pupils and teachers) can be mobilised, and institutions (in this case primary schools) which previously were mainly reproducing traditional values and academic knowledge can be used as resource centres for participatory and sustainable community change. The keywords are: locally adapted, evidence-based planning, collaboration on equal terms, and a long-term perspective – tenets which may be troublesome to developers at the macro level, but are the only way to achieve sustainable change.

Acknowledgements

This study was conducted within the framework of the Kenyan–Danish Health Research Project (KEDAHR) and with funding from the Danish Bilharziasis Laboratory. We acknowledge the support from Mbeka Primary School, and particularly the headmaster, Jeremiah Nyamezi, and the 1998, 1999, 2000, and 2001 Class 6 pupils, the local community, the area and district educational authorities, the National Museum of Kenya, and the local NGO ‘Care for the Earth’ for their support of this study. Also thanks to Bjarne Bruun Jensen at the Research Centre for Environmental and Health Education, Danish University of Education, for substantial help during planning and analysis. Finally, we are grateful to anonymous reviewers at *Development in Practice* for constructive comments.

Notes

1 The project forms part of the Kenyan–Danish Health Research Project (KEDAHR), which is an

interdisciplinary research project operating at the interface between health and education and with focus on research capacity building and applied research.

- 2 The implicit assumption is, of course, that intake of nutritious herbs can counter micronutrient deficiencies. However, there is an important added advantage. The herbs can serve as an important source of income generation not least for vulnerable groups such as orphans or elderly people without support.
- 3 By action-research we understand an endeavour which used research as a tool to improve the living conditions of a given population in a concrete way and with their active involvement in at least some stages of the process. Although this term is often used in a more comprehensive way, addressing fundamental issues in society, we still find that our project falls within the same category.
- 4 To clarify the terminology, by ‘traditional’ we mean something that has been an integrated part of a culture

- for about a generation or more. The term 'wild' alludes to something that can be procured in nature (although some of the herbs in this study were both wild and cultivated). A 'food item' is anything edible (in this study we are concentrating on plants, but some insects also belong to this category). According to Southgate (2000:349), vegetables can be divided into the categories of tubers, roots, leafy vegetables, legumes (or pulses), and fruits commonly considered as vegetables. Vegetables belong to the more general category of 'plants' or 'herbs', but do not include fungi (two of which we discuss in the present study). Consequently, the correct term for the topic of the present study would be 'edible, mostly leafy, and mostly wild growing, green plants plus a few fungi, that have been part of the Luo culture for a long timespan'. So, although slightly imprecise, we have chosen to use the term 'traditional vegetables'!
- 5 The teacher, Domnic Abudho, who was at MPS for the first three years, is a co-author of this article and is presently working in a neighbouring school where he is in the process of introducing a similar project.
 - 6 Innovatively, one notable, newly acquired piece of knowledge was on the preparation of compost manure. Briefly, three separate holes were dug into which plant leaves and animal wastes were sequentially put and turned. A long stick of about 1.5m, referred to as the 'thermometer', was stuck into the second hole in which almost ready manure was placed. This stick was felt and a rise in soil temperature could be detected. A rise in temperature meant that soil organisms were active and decomposition was taking place, which by implication meant that no water needed to be added to the hole. When it was very hot, water was added. A fall in temperature meant that soil organisms were not active, and the soil needed turning. This new technology has served as a major contributing factor to the success of the project and has been adopted in neighbouring farms.
 - 7 One year ago a national reform of the educational system made agriculture non-examinable – much to the regret of the teachers as it is feared the pupils will be less motivated in an educational environment where competition and good marks are usually seen as a strong incentive.
 - 8 Some readers may question the selection criteria and advocate for a more random choice. However, we maintain the importance of selecting the most suitable for the project to get the best possible start.
 - 9 There were even cases where some of the pupils who had to repeat Class 6 expressed satisfaction that they could now be actively involved in the horticulture activities for one more year.
 - 10 The school year in Kenya runs from January to November and is divided into three terms.
 - 11 Based on the accumulated experience, CftE and the researchers have provisional plans for a further expansion into another ten schools.
 - 12 The reasons for this can only be guessed. Partly, the natural habitats of the traditional vegetables are reduced in many parts of Luoland because of increased population pressure and subsequent increase of cultivated land. Partly, modernisation has introduced new vegetables (e.g. *sukuma wiki*), which (although less nutritious) have marginalised the traditional herbs.

References

- Bailey, D., H. Hawes and G. Bonati (1992) *Child-to-Child: A Resource Book, Part 1*, London: Child-to-Child Trust.
- Chambers, R. (1983) *Rural Development: Putting the Last First*, Harlow: Longman.
- Chambers, R. (1997) *Whose Reality Counts? Putting the First Last*, London: IT Publications.
- Committee of Micronutrient Deficiencies (1998) *Prevention of Micronutrient Deficiencies: Tools for Policymakers and Public Health Workers*, Committee of Micronutrient Deficiencies, Board on International Health, Institute of Medicine, Washington, DC: National Academy Press.
- Food and Agricultural Organisation (FAO) (1968) *Food Consumption Table for Use in Africa*, Geneva: Division of Nutrition, FAO.
- Friis, H., D. Mwaniki, B. Omondi, E. Muniu, P. Magnussen, W. Geissler, F. Thiong'o, K. Michaelsen and F. Michaelsen (1997) 'Serum retinol concentrations and Schistosoma mansoni, intestinal helminths, and malaria parasitemia: a cross-sectional study in Kenyan preschool and primary school children', *American Journal of Clinical Nutrition* 66:665-671.
- James, A., C. Jenks and A. Prout (1998) *Theorising Childhood*, Cambridge: Polity Press.
- Jensen, B. B. and K. Schnack (eds.) (1994a) *Action and Action Competence as Key Concepts in Critical Pedagogy*, Studies in Educational Theory and Curriculum, Volume 12, Copenhagen: Royal Danish School of Educational Studies.
- Leemon, M. and S. Samman (1998) 'A food-based systems approach to improve the nutritional status of Australian aborigines: a focus on zinc', *Ecology of Food and Nutrition* 10:1-33.
- Meinert, L. (2001) 'The quest for a good life: health and education among children in eastern Uganda', unpublished PhD thesis, University of Copenhagen and Danish Bilharziasis Laboratory.
- Ogoye-Ndegwa, C. and J. Aagaard-Hansen (forthcoming) 'Luo traditional vegetables: an anthropological nutrition project in western Kenya', *Ecology of Food and Nutrition*.
- Onyango-Ouma, W. (2001) 'Children and health communication: learning about health in everyday relationships among the Luo of western Kenya', unpublished PhD thesis, University of Copenhagen and Danish Bilharziasis Laboratory.
- Pridmore, P. J. (1997) 'Children as health educators: the child-to-child approach', unpublished PhD thesis, London: University of London.
- Southgate, D. A. T. (2000) 'Vegetables, fruits, fungi and their products', in J. S. Garrow, W. P. T. James and A. Ralph (eds.) *Human Nutrition and Dietetics*, London: Churchill Livingstone.
- Sub-Committee on Nutrition (ACC/SCN) (1997) *Third Report on The World Nutrition Situation*, Geneva: WHO.
- Sub-Committee on Nutrition (ACC/SCN) (2000) *Nutrition Throughout the Life Cycle: Fourth Report on The World Nutrition Situation*, Geneva: WHO.
- Wals, E. J. A. (1994) 'Action taking and environmental problem solving in environmental education', in B. B. Jensen and K. Schnack (eds.) *Action and Action Competence as Key Concepts in Critical Pedagogy*, Studies in Educational Theory and Curriculum, Volume 12, Copenhagen: Royal Danish School of Educational Studies.

This article was first published in Development in Practice (12/3&4:449-460) in 2002.