Assessment of food gardens as nutrition tool in primary schools in South Africa

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Objectives: To assess knowledge, perceptions and practices on food production amongst learners and educators, gardening activities and management of school food gardens in schools participating in the National School Nutrition Programme.

Design: Cross-sectional survey.

Setting: Ten purposively selected primary schools in each of the nine provinces of South Africa (total: n = 90).

Subjects and outcome measures: Questionnaire data were collected from the garden administrators (n = 66), garden workers (n = 55), educators (n = 687) and learners (n = 2547). A checklist was completed for the school garden (n = 66) by observation.

Results: Sixty-six (73%) schools had a food garden, varying in size (100 m² – 6 000 m²). A variety of vegetables, but few fruit, were grown. Problems experienced with gardens were mostly lack of funds (59%), tools and infrastructure (47%), garden workers (53%) and technical support (50%). Few schools received external funding for food gardens. In 50% of gardens, crops were growing for > 6 months, and 30% of gardens provided fresh produce for school meals more than twice a week. Fifty-four percent (54%) of learners were involved in school gardens, and 67% had food gardens at home. Attitudes of learners and educators towards both food gardening and eating vegetables and fruit were generally positive; 68.4% of learners and 86.4% of educators indicated they like to eat vegetables every day.

Conclusions: School food gardens as a vehicle for improving nutrition should be strengthened through training of educators and garden personnel, and support by external role players and policy directives are needed to enhance sustainability.

Keywords: agriculture, National school nutrition program, school food gardens

Introduction

The National School Nutrition Programme (NSNP) managed by the National Department of Basic Education (DBE) is a large government funded program that provides school meals to children in quintile one to three schools in South Africa. The NSNP has three pillars: (i) the feeding programme providing meals to learners; (ii) nutrition education promoting healthy lifestyles and eating; and (iii) sustainable food production in schools (SFPS) promoting food production and skills transfer to schools and communities aimed at food security.

School food gardens are a vehicle for spreading knowledge of food production, creating a culture and love for food gardening and making the link with nutrition. Introduction of school food gardens has been shown to be associated with changes in children’s skills and attitudes conducive to enhancing vegetable and fruit consumption, improved knowledge about vegetables focusing on school food production practices and utilisation of garden produce; knowledge, perceptions and practices on food production amongst learners and educators; as well as attitude towards eating vegetables and fruit.

A baseline study in 90 purposively selected primary schools was done as part of an initiative of the DBE, with support of the Food and Agriculture Organisation of the United Nations (FAO), to strengthen the SFPS and nutrition education components of the NSNP. This paper describes results of the SFPS assessment, focusing on school food production practices and utilisation of garden produce; knowledge, perceptions and practices on food production amongst learners and educators; as well as attitude towards eating vegetables and fruit.

Methods

Study population and design

This cross-sectional study included ten quintile one to three primary schools (n = 90) in one district in each of the nine South African provinces. Schools were purposive selected by the DBE to include diverse agro-ecological characteristics and a mixture of urban, peri-urban, farm and village schools. The school food environment for these 90 schools and a detailed description of the regions are described elsewhere. Data for the SFPS assessment were collected through a set of structured
questionnaires as summarised in Table 1. In some provinces the anticipated number of completed questionnaires was not reached, as some of the selected study participants were not available on the survey day(s). Data were collected by 28 trained fieldworkers (DBE officials) from March to October 2010.

**Measuring tools**
Reports of the Department of Education,18 previous evaluations of the Primary School Nutrition Programme10,11 and school food gardens2 and guidelines received from the FAO Nutrition Education and Consumer Awareness Group were used to develop the measuring tools (see Table 1). Educators’ and learners’ attitudes towards eating vegetables and fruit were assessed using a five point hedonic scale. The questionnaires for learners and educators were tested in four schools. Educators evaluated the questionnaires for face validity and appropriateness of the questions was tested in a group of 15 grade 5 to 7 learners (five learners per grade), and one educator per grade per school. The checklists and remaining questionnaires were tested in nine schools (one per school). Modifications were made where necessary.

The questionnaires for garden workers and learners were translated into six of the national languages (Sepedi, isiXhosa, isiZulu, isiNdebele, Setswana and Afrikaans). The translations were verified through back translations and group discussions to ensure that the meaning of the questions was retained. Corrections were made where necessary. Questionnaires for the educators and garden administrators were completed in English. Questionnaires were piloted in three provinces, one school per province, in areas similar to the selected survey areas. The questionnaires were revised where needed.

**Data analysis**
Descriptive data analysis was done using the statistical software package IBM SPSS Statistics 18. Categorical data were expressed as frequencies and percentages. Missing values were excluded during data analysis.

**Results**
The study sample included rural (49%), peri-urban (19%), urban (17%) and farm schools (15%). Sixty-six of the 90 schools (73%) had a food garden. The garden administrator, an educator assigned the task, was assisted/supported by the school principal (55%), garden committee (56%), community members (35%) and parents (29%) to keep the school food garden going.

**Gardening practices**
The size of school food gardens varied, with the majority (82%) being between 100 m² and 6 000 m² (Table 2). Schools in the Eastern Cape, Limpopo and Mpumalanga generally had larger gardens, with ≥ 50% of the gardens being > 1 000 m². Sixty-five percent (65%) of food gardens were fenced, 82% had an organised layout and 74% were weeded. Watering was done mostly by hosepipe (56%) or using a bucket or watering can (22%). Tap water was the main source of irrigation water in 66% of gardens (51% school tap; 15% garden tap). Water for irrigation was available every day of the week for 50% of gardens. Pesticides were used in 44% of gardens, and some safety precautions were in place. Almost half of the gardens produced vegetables for more than six months of the year, but production seems low as in only 30% of the gardens harvesting was done two or more times a week. Problems experienced with the gardens included lack of funds (59%), tools and infrastructure (47%), garden workers (53%) and technical support (50%).
Spinach, carrot, beetroot, cabbage and onion were planted in more than 80% of gardens, followed by tomatoes (67%) and lettuce (42%). Less popular vegetables included green/yellow/red pepper, potato and pumpkin, which were grown in 30 to 39% of gardens, and butternut and miroho/marogo (traditional leafy vegetables), which were grown in 20 to 29% of gardens. Beans (legumes) were planted in 59% of gardens. Few fruit were produced, of which peach was most prevalent (21%). Grain production mostly consisted of growing maize (36%). Very few schools grew herbs.

Management of the school food garden
Information on the management of the school food garden is presented in Table 3. Learners were involved in garden activities in 89% of the schools (certain grades, 71%; all learners, 18%). Educators (59%), and to a lesser extent parents (36%) and community members (33%), were also involved in garden activities. During school holidays, 77% of the school food gardens were attended to. This was either by the gardener/s (32%), community/parents (26%) or school caretaker (24%). Contingency of garden activities during absence of the garden administrator was implemented in 83% of schools. Half of the gardens were solely subsidised from the school funds; 29% of schools had an annual budget for food gardens; 47% of gardens were self-supporting; and 23% of food gardens generated an income. Few school gardens were linked with outside organisations, such as NGOs (non-governmental organisations), businesses and charity organisations.

Training of garden administrators and garden workers
Information on training received for garden administrators and garden workers is presented in Table 4. The garden administrators mainly received technical advice from colleagues and friends (59%) and officials from Department of Education (50%). Only 41% of garden administrators had received training in food production, provided mostly by the Department of Education, NGO’s or Department of Agriculture.
Garden workers were either appointed (60%), the caretaker of the school (35%) or a volunteer/parent (6%). The mean number of years of garden experience for garden workers was 4.75 years. Eighty-two percent (82%) of garden workers worked closely with the educator responsible for garden administration. Only 31% of the garden workers had received some training; 67% were confident with growing vegetables and 40% with growing fruit.

**Learners’ involvement in the school food garden**

The involvement of learners in the school food garden as indicated by the garden administrator (n = 66) is presented in Table 5. Learners in general spent 1-4 hours per week in food gardens, with an average of 2.1 hours. In 28% of the schools, an incentive was given for involvement in the food garden, which included produce or seedlings to take home, certificates, excursions and, if available, financial remuneration (data not shown). Of those learners whose school had a food garden, 54% were involved in the garden, mostly in terms of watering (41%), planting (22%), soil preparation (19%), and keeping the garden tidy/weeding (15%). According to the garden administrator (Table 5), learners considered garden activities as fun (48%) or an achievement (39%), as the learners were happy to see the results, proud to see the produce, enjoyed eating the produce, enjoyed being outside, and were eager to learn the new skills enabling them to plant a food garden at home. According to the educators, a school food garden can be a valuable tool to learn a variety of skills as indicated in Table 5.

Two-thirds of the learners had food gardens at home, of whom 79.2% usually helped in the garden, mostly to water plants (52.2%) and some assisted with planting (20.5%) and digging (16.6%).

**School food garden used for education**

According to educators, the specific role of school gardens in nutrition education (Table 6) was indicated, amongst others, to learn about healthy eating and nutrition (19.2%), to learn about a healthy lifestyle (15.9%), to participate in school gardening (16.6%) and encourage learners to have their own food gardens (14.0%). Nearly half (48.5%) of the educators had some experience in vegetable gardening, but only a few (12.5%) had received training in vegetable production. Educators obtained information on gardening (data not tabulated) mostly from books/libraries (28.5%), magazines/newspapers (28.0%), television (25.7%), radio (18.0%), school (16.7%) and family/friends (11.2%).

**Attitudes towards eating vegetables and fruit**

The majority of respondents agreed or tended to agree that vegetables (81.8% educators; 84.1% learners) and fruit (92.3% educators; 89.9% learners) taste good, and that it is important to eat vegetables of different colours (89.2% educators; 76.1% learners). In total, 86.4% of the educators and 68.6% of the learners liked to eat vegetables every day, while 93.2% of educators and 84.5% of learners liked to eat fruit every day.

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**Table 3: Maintenance and management of the school food garden**

| Individuals involved in the school food garden activities | % |
|-----------------------------------------------------------|---|
| Certain grades of learners                                 | 71 |
| Gardener                                                   | 65 |
| Educators                                                  | 59 |
| Parent/s                                                   | 36 |
| Community member/s                                         | 33 |
| All learners                                               | 18 |

**Table 4: Training of educator responsible for management of the food garden and the garden worker**

| Information obtained from the garden administrator (n = 66) | % |
|------------------------------------------------------------|---|
| Source from where garden administrator gets technical advice on gardening | |
| Colleagues and friends                                     | 59 |
| Officials from Department of Education                     | 50 |
| Parents                                                    | 42 |
| Community members                                          | 39 |
| Extension officer (Department of Agriculture)              | 38 |
| NGOs                                                       | 26 |
| Printed media                                              | 26 |
| Nowhere                                                    | 14 |
| Commercial farmer                                          | 11 |
| Garden administrator has received training in management of the food garden | 41 |

**Table 5: Maintenance and management of the school food garden**

| Position of the garden worker | % |
|-------------------------------|---|
| Garden worker appointed by school | 60 |
| Caretaker of the school        | 34 |
| A volunteer/parent             | 6  |

**Information obtained from the garden worker (n = 55)**

| Position of the garden worker | % |
|-------------------------------|---|
| Garden worker works closely with the educator responsible for garden administration | 82 |

| Source from where garden administrator gets technical advice on gardening | % |
|----------------------------------------------------------------------------|---|
| Garden worker's level of confidence about growing vegetables?              | |
| Confident                                                                  | 67 |
| Need some assistance                                                       | 29 |
| Not confident at all                                                       | 4  |

| Source from where garden administrator gets technical advice on gardening | % |
|----------------------------------------------------------------------------|---|
| Garden worker's level of confidence about growing fruits                  | |
| Confident                                                                  | 40 |
| Need some assistance                                                       | 40 |
| Not confident at all                                                       | 20 |
Table 5: Involvement of learners in food garden and link with curriculum

| Information obtained from the garden administrator (n = 66) | % |
|---------------------------------------------------------------|---|
| Amount of time per week learners spend in the food garden     |   |
| <1 hour                                                       | 18|
| 1 – 2 hours                                                   | 43|
| 3 – 4 hours                                                   | 28|
| > 5 hours                                                     | 11|
| It is compulsory or voluntary for children to take part in school food garden activities |   |
| Compulsory                                                   | 12|
| Voluntary                                                    | 40|
| Mainly voluntary, but compulsory in some instances           | 36|
| Children do not work in the garden                           | 12|
| There are incentives for children taking part in garden activities | 28|
| How do children see garden activities, according to garden administrator |   |
| It is fun                                                     | 48|
| It is an achievement                                          | 39|
| It is their duty                                              | 8 |
| It is a punishment                                            | 5 |
| Skills children learn through the vegetable garden, according to the garden administrator |   |
| How to grow crops                                            | 80|
| Life skills; how to plan; take decisions; collaborate; take responsibility; explain and persuade | 80|
| Appreciation of healthy food and healthy diet                | 80|
| How to run a successful garden                                | 77|
| Environmental awareness; respect for nature                  | 77|
| Personal and social development                               | 73|
| Natural resource management                                   | 73|
| Organic approaches for gardening (not just for food)          | 68|
| Business skills and entrepreneurship                          | 65|
| Mathematics                                                   | 62|
| Art                                                           | 53|
| Drama                                                         | 38|

Table 6: Educator’s perceptions and knowledge on school food gardens

| Information from educators (n = 687) | % |
|--------------------------------------|---|
| Educator’s perception on the role of a school-based food garden in nutrition education |   |
| Learn about healthy eating and nutrition | 19.2|
| Participation in school gardening     | 16.6|
| Learn about healthy lifestyle         | 15.9|
| Encourage learners to have their own gardens | 14.0|
| Learners obtain skills on how to grow vegetables e.g. when and which to plant | 11.5|
| Show learners where vegetables come from and what they look like | 9.5|
| Assist educators to include nutrition in learning areas e.g. in Life Orientation | 8.0|
| Learners obtain knowledge on importance of growing vegetables; know to grow it themselves | 4.8|
| Educator has some experience in vegetable gardening | 48.5|
| Educator has received some training in vegetable production | 12.5|

Discussion

The survey showed considerable variation in the set-up, condition and management of school food gardens while the general attitude towards food production amongst the various interviewees was positive. Educators were of the opinion that school food gardens play a role in, amongst others, learning about healthy eating and nutrition and encouraging learners to have their own vegetable gardens. While schools are encouraged to have a food garden as an education tool to transfer knowledge and skills and encourage local food production within the school community, factors affecting viability and sustainability of the gardens need to be identified and addressed.

Sustainability of food gardens

A number of constraints with the food gardens were identified. Addressing the major constraints (supplies, technical support, infrastructure and tools) will enhance sustainability. Technical information is available since development of the Horticulture Manual for Schools, whilst more attention can be given to training of garden workers and garden administrators. With the Department of Agriculture becoming more involved in school food gardens in 2015, it can be speculated that this situation will improve over time. Furthermore, Davis and co-workers argued that not all schools have the capacity to maintain food gardens, and that educator and parent involvement is critical. Larger involvement of external organisations should be sought through larger efforts of publicising the school gardens and the potential benefits to the learners. This will be instrumental in finding outside support (e.g. from NGOs) to sustain school gardens.

School gardens as source of food

Producing vegetables and fruit locally, either in the school garden or within the community, can potentially increase the amount of vegetables and fruits included in the school meal. We previously reported that although 95% of schools obtained food for the school meal from the suppliers, in 43% of the schools food for the school meal was obtained from the school’s food garden, while 9% of schools obtained foods locally grown in the community. While the bigger gardens may have the potential to make a significant contribution to food supply, the smaller gardens will not be able to provide a continuous supply of vegetables in sufficient amounts for the school meals. Increasing the supply of vegetables to schools from small local enterprises has large potential for business creation, particularly in rural areas.

School garden as nutrition education tool

School gardens are useful as learning tools for both gardening and healthy eating. In a review paper, David and co-workers highlighted the importance of learners obtaining hands-on experience in school gardens: this can increase knowledge of vegetables, willingness to taste vegetables, and intake of vegetables and fruit when school gardens are a component of nutrition education.

In South Africa, intake of vegetables and fruit is generally low, whilst the local food-based dietary guidelines does promote consumption. Using school gardening activities to promote and strengthen home gardens could be a useful strategy to increase availability of vegetables and fruit at household level. Agricultural interventions aimed at increasing household food production, were shown to significantly improve dietary patterns and vitamin A intake in women and children. The importance of nutrition-sensitive agricultural programs aimed at improving
access to high-quality diets in resource poor communities has previously been emphasised. Improving access to and affordability of vegetables and fruit through schools in low-income communities is also one of the strategies recommended by the Institute of Medicine’s Committee on Accelerating Progress in Obesity Prevention in the United States. The attitude of educators and (to lesser extent) learners towards eating vegetables and fruit are positive indicators for downstream use of products from school food gardens. In total, 68% of the learners agreed or tended to agree that they like to eat vegetables every day. Exposure to vegetables through involvement in school gardens was shown to increase children’s willingness to taste vegetables and also improved the taste ratings for some of the vegetables. It has been suggested that, for school-based strategies to improve vegetable and fruit intake in learners, more information is needed on the types of vegetables and fruit that are appealing to children. A Nutrition Education Manual, based on the South African food-based dietary guidelines, which is an education tool to educate the population on healthy eating, was made available to schools. A colour coded system for classifying the beneficial properties of vegetables and fruits to describe the nutritional diversity of foods grown in school gardens can potentially be used in combination with the food-based dietary guideline “eat plenty of vegetables and fruit” as an educational tool link to school gardens; this should be investigated further.

Policy framework and conclusion
A policy framework for achieving healthy school food environments exists in South Africa in the form of the Integrated School Health Policy (ISHP), which is a joint initiative between the National Departments of Education and Health. In addition, the National Policy in Food and Nutrition Security and the National Development Plan further support the focus on food and nutrition security. Close collaboration between the Department of Agriculture, who now takes responsibility for school food gardens, and the Departments of Education and Health is needed to create links between the food garden, nutrition education and the national school nutrition programme. The current survey showed that school food gardens varied in size, production and management. Furthermore, training of educators and garden personnel, provision of gardening equipment and technical advice, as well as support by government and various role players, is needed to strengthen the school food gardens.

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