South African Journal of Clinical Nutrition 2017; 30(4):80–86
https://doi.org/10.1080/16070658.2017.1271609

SAJCN
ISSN 1607-0658 EISSN 2221-1268

RESEARCH

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

Sunette M Laurie[a]*, Mieke Faber[b] and Mamokele M Maduna[c]

[a]*Agricultural Research Council - Vegetable and Ornamental Plants, Pretoria, South Africa*
[b]*Non-Communicable Diseases Research Unit, South African Medical Research Council, Cape Town, South Africa*
[c]*Department of Basic Education, Directorate Sustainable Food Production in Schools, National School Nutrition Programme, Pretoria, South Africa*
**Corresponding author, email: SLaurie@arc.agric.za*

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 ($n = 2\,547$). 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 m^2 – 6 000 m^2). 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.[1]

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,[2] improved knowledge about vegetables and fruit toward positively influencing dietary habits for children at an early age,[3] and changes in food behaviour.[4] Multi-component interventions were shown to be effective in promoting a healthy diet in school children.[5] School food gardens also have the potential to provide, to some extent, locally grown vegetables, fruit and legumes to be included in the school meal. Access to and quality of produce can be increased through local production, either in school gardens or local small-scale farmers.

For school gardens to be successful, the gardens need to be sustainable and well-managed. Challenges in establishing and sustaining school gardens have previously been reported and include insufficient knowledge and skills to manage the garden effectively; a lack of basic resources such as water, fencing (to prevent theft and vandalism), seed, and garden implements; poor quality of soil; harsh climatic conditions; pest and disease infestation; a lack of support and commitment from school governing bodies and parents; seasonality in planting; and, the challenge of growing sufficient vegetables to supply schools that have a large enrolment of school children.[6,7] Another major challenge identified was failure to link school gardens with other core-curriculum and extra-curriculum activities.

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.[8] Data for the SFPS assessment were collected through a set of structured

Table 1: Summary of respondents and information collected

Source of information	Type of questionnaire	Information provided
Educator responsible for administration of the food garden (*n* = 66)	self-administered questionnaire	• role players in the food garden • integration of food gardening in curriculum • crops grown, problems experienced • source of advice and funding
Garden worker (*n* = 55)	interviewed by a fieldworker	• interaction and collaboration with garden administrator • training received and confidence with growing crops • constraints with garden
Food garden (*n* = 66)	by observation using a checklist	• size of the garden (by measurement) • physical aspects such as fencing, condition and organisation of the garden
Grade R (reception year) to grade 7 educators (*n* = 687; 22% male and 78% female) the majority (47%) were between 40 and 50 years old, and 52% had been at the current school for at least 10 years. [one randomly selected educator per grade]	self-administered questionnaire	• their opinion of the value of the food garden and its role in nutrition • sources for gardening information • attitudes towards eating vegetables and fruit
Grade 5 to 7 learners (*n* = 2547; 49.7% boys and 50.3% girls) 30 randomly selected learners (10 per grade) per school	questionnaire completed in small groups under guidance of a fieldworker	• involvement in food garden and tasks executed • attitudes towards eating vegetables and fruit

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,[1,9] previous evaluations of the Primary School Nutrition Programme[10,11] and school food gardens[2] 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.

Ethical considerations

The study was conducted according to the guidelines laid down by the Declaration of Helsinki. The Ethics Committee of the South African Medical Research Council and, relevant senior managers in the provincial Departments of Education and school headmasters gave permission to do the study. Adult respondents (educators, garden workers, garden administrators) and parents of the selected learners gave informed written consent; while, the learners gave written assent.

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 m^2 and 6 000 m^2 (Table 2). Schools in the Eastern Cape, Limpopo and Mpumalanga generally had larger gardens, with ≥ 50% of the gardens being > 1 000 m^2. 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%).

Table 2: Information on the school food garden

Information collected by observation (*n* = 66)	%
Approximate size of the food garden	
<100 m²	13
100 – 499 m²	35
500 – 999 m²	15
1 000 – 6 000 m²	32
1 – 10 ha	5
There are signs of educational activity (e.g. labels, signs, name tags)	38
There is a compost heap	39
There are fruit trees	30
Information obtained from the garden worker (*n* = 55)	
Method of watering the crops	
Hose pipe	56
Buckets or watering can	22
Sprinklers	16
Other (none, drippers)	6
Sources of water for irrigation	
School tap	51
Borehole	18
Garden tap	15
Water tank	11
Other (not specified)	5
How often is there water available to irrigate the garden?	
Always (5 days per week)	50
3 – 4 days a week	23
1 – 2 days a week	17
Seldom	10
Pesticides are being used to control pest and diseases	44
Precautions taken to ensure safe use of pesticides (% of those using pesticides (n = 44))	
Chemicals are locked away	92
Learners do not spray chemicals	50
Use recommended dosages	88
Wear protective clothing and mask	54
Number of months per year that vegetables are obtained from the garden	
1 – 3 months per year	26
4 – 6 months per year	25
7 – 9 months per year	23
Whole year	26
During the period vegetables are obtained from garden, frequency of harvesting	
Two or more times per week	30
Twice per month	30
Once per month	15
Only some of the month	25
Information collected from the garden administrator (*n* = 66)	
Methods used in the school's food garden	
Crop rotation	65
Compost making	47
Permaculture/Trench gardens (no digging, organic garden)	26
Integrated pest management (e.g. chilly sprays, soap to control insects)	23
Water harvesting or saving (catching rain water, mulching, sunken beds)	21
Space efficient techniques (e.g. tower gardens, bag gardens, tyre gardens)	15
Hydroponics (cultivate without soil, fertilizer mixed into irrigation)	14
Using waste water (e.g. from washing)	12
Problems experienced with the food gardens	
Lack of funds for supplies (seed, fertilizer)	59
Lack of garden workers	53
Lack of technical support	50
Lack of infrastructure (e.g. fence, space)	47
Lack of garden tools, equipment	47
Lack of knowledge on gardening	39
Theft of food/vegetables produced in the garden	35
Difficulty in motivating learners to work in the garden	33

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.

Table 3: Maintenance and management of the school food garden

Information obtained from garden administrator (*n* = 66)	%
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
School keeps record of food garden activities and produce	43
School has someone who looks after the food garden during school holidays	77
School has someone taking over the responsibility in case the garden administrator is absent/ill	83
Sources of funding available for the food garden	
Subsidised from school funds	50
Income from sales	12
Income from sales and sponsorship	8
Subsidised from school funds and income from sales	6
Subsidised from school income, income from sales, sponsorship	4
Sponsorship from business	4
Subsidised from school funds and sponsorship from business	2
Other (not specified)	14
School has an annual budget for the food garden	29
The food garden is self-supporting	47
The food garden makes an income	23
An NGO is involved with the food garden	21
A business is involved with the food garden	12
The food garden has a logo or slogan	11
The school advertises or publishes about the food garden so that the community knows about it	38

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
NGO's	26
Printed media	26
Nowhere	14
Commercial farmer	11
Garden administrator has received training in management of the food garden	41
Information obtained from the garden worker (*n* = 55)	
Position of the garden worker	
Garden worker appointed by school	60
Caretaker of the school	34
A volunteer/parent	6
Garden worker works closely with the educator responsible for garden administration	82
Garden worker has received some training in vegetable production	31
Garden worker's level of confidence about growing vegetables?	
Confident	67
Need some assistance	29
Not confident at all	4
Garden worker's level of confidence about growing fruits	
Confident	40
Need some assistance	40
Not confident at all	20

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.

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,[12] 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[13] 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.[14] This will be instrumental in finding outside support (e.g. from NGOs) to sustain school gardens.[6]

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.[8] 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.[15]

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[13] 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.[3,16]

In South Africa, intake of vegetables and fruit is generally low,[17] whilst the local food-based dietary guidelines does promote consumption.[18] 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.[19] The importance of nutrition-sensitive agricultural programs aimed at improving

access to high-quality diets in resource poor communities has previously been emphasised.[20] 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.[21]

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.[22] 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.[14] 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.[23] A colour coded system for classifying the beneficial properties of vegetables and fruits to describe the nutritional diversity of foods grown in school gardens[24] 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[25] 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[26] and the National Development Plan[27] further supports 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.

Acknowledgements – The authors gratefully acknowledge the Food and Agriculture Organisation (FAO) of the United Nations for funding of the study (grant number TCP/SAF/3101 (D)); Dr Ellen Muelhoff of FAO for providing technical advice; officials from Provicial Department of Basic Education for surveying schools; Dr Carl Lombard (statistician in the Biostatistics Unit of the South African Medical Research Council) for sample size determination; and, Ms ME Malebana and Ms WM Mphela (research technicians at the Agricultural Research Council) and Mrs Lee-Ann Human (research technician at the South African Medical Research Council) for assistance with data management.

References

1. Department of Education. National guidelines for the implementation, monitoring and reporting on the National School Nutrition Programme. Pretoria: South African Department of Education; 2008.
2. Somerset S, Markwell K. Impact of a school-based food garden on attitudes and identification skills regarding vegetables and fruit: a 12-month intervention trial. Public Health Nutr. 2009;12:214–21. https://doi.org/10.1017/S1368980008003327
3. Parmer SM, Salisbury-Glennon J, Shannon D, et al. School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. J Nutr Educ Behav. 2009;41:212–7. https://doi.org/10.1016/j.jneb.2008.06.002
4. Blair D. The child in the garden: an evaluative review of the benefits of school gardening. J Environ Educ. 2009;40:15–38. https://doi.org/10.3200/JOEE.40.2.15-38
5. Van Cauwenberghe E, Maes L, Spittaels H, et al. Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature. Br J Nutr. 2010;103:781–97. https://doi.org/10.1017/S0007114509993370
6. Castle J, Bialobrzeska M. School-based nutrition programmes: an intervention for mitigating the impact of HIV and AIDS on vulnerable learners. *SAIDE Newsletter*. 2009;15(1). [cited 2015 Dec] Available from: http://www.saide.org.za
7. Public Service Commission. Report on the evaluation of the national school nutrition programme (NSNP). Pretoria: The Public Service Commission; 2008.
8. Faber M, Laurie S, Maduna M, et al. Is the school food environment conducive for healthy eating in poorly resourced South African schools? Public Health Nutr. 2014;17(6): 1214–23. doi: https://doi.org/10.1017/S1368980013002279.
9. Department of Education. Report on the evaluation of the school nutrition programme (NSNP). Pretoria: South African Department of Education; 2008.
10. Louw R, Bekker E, Wentzel-Viljoen E. External evaluation of certain aspects of primary school feeding. Pretoria: South African Department of Health; 2001.
11. Wentzel-Viljoen E, Swart EC, Vorster HH, et al. Evaluation of the primary school nutrition programme (PSNP) in the North West province. Final report to the Department of the Premier. Mmabatho: North West Provincial Government; 2000.
12. Department of Basic Education. Horticulture manual for schools: a guide to establish and sustain food gardens. Pretoria: National School Nutrition Programme, Department of Basic Education; 2011. [Authors: Laurie S, van den Heever E, du Plooy I, Mkula L, Agricultural Research Council].
13. Davis JN, Spaniol MR, Somerset S. Sustenance and sustainability: maximizing the impact of school gardens on health outcomes. Public Health Nutr. 2015;18:2358–67. https://doi.org/10.1017/S1368980015000221
14. Food and Agriculture Organization [FAO]. Setting up and running a school garden. A manual for teachers, parents and communities. Rome: Author, 2005. [cited 2016 Sep] Available from: http://www.fao.org/docrep/009/a0218e/a0218e00.HTM
15. Bienabe E, Vermeulen H. New trends in supermarket procurement systems in South Africa: the case of local procurement schemes from small-scale farmers by rural-based retail chain stores. London: Regoverning Markets Innovative Practice series, IIED; 2008. [cited 2016 Oct] Available from: http://pubs.iied.org/pdfs/G03263.pdf
16. Gatto NM, Ventura EE, Cook LT, et al. LA Sprouts: a garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. J Acad Nutr Diet. 2012;112:913–20. https://doi.org/10.1016/j.jand.2012.01.014
17. Mchiza ZJ, Steyn NP, Hill J, et al. A review of dietary surveys in the adult South African population from 2000 to 2015. Nutrients. 2015;7:8227–50. https://doi.org/10.3390/nu7095389
18. Naudé C. "Eat plenty of vegetables and fruit every day": a food-based dietary guideline for South Africa. S Afr J Clin Nutr. 2013;26:S46–S56.
19. Girard WA, Self JL, McAuliffe C, et al. The effects of household food production strategies on the health and nutrition outcomes of women and young children: a systematic review. Paediatr Perinat Epidemiol. 2012;26:205–22. https://doi.org/10.1111/ppe.2012.26.issue-s1
20. Ruel MT, Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? Lancet. 2013;382:552–69.
21. Institute of Medicine [IOM]. Best care at lower cost: The path to continuously learning health care in America. Washington, DC: The National Academies Press; 2012.

22. Morgan PJ, Warren JM, Lubans DR, et al. The impact of nutrition education with and without a school garden on knowledge, vegetable intake and preferences and quality of school life among primary-school students. Public Health Nutr. 2010;13:1931–40. https://doi.org/10.1017/S1368980010000959
23. Department of Basic Education. Nutrition education manual vol 1: educators. national school nutrition programme. Pretoria: Department of Basic Education; 2010. [Authors: Oldewage-Theron WH, Egal AA, Vaal University of Technology].
24. Guitart DA, Pickering CM, Byrne JA. Color me healthy: food diversity in school community gardens in two rapidly urbanising Australian cities. Health & Place. 2014;26:110–7. https://doi.org/10.1016/j.healthplace.2013.12.014
25. South African Departments of Health and Basic Education. Integrated school health policy. 2013. [cited 2016 Mar] Available from: http://www.health-e.org.za/wp-content/uploads/2013/10/Integrated_School_Health_Policy.pdf
26. Department of Agriculture. Forestry and fisheries. national policy on food and nutrition security. Pretoria: South African Department of Agriculture, Forestry and Fisheries; 2013. [cited from 2014 Sep] Available from: http://www.nda.agric.za/doaDev/sideMenu/foodSecurity/policies.pdf
27. National Development Plan. Our future make it work. Pretoria: National Planning Commission; 2013. [cited 2016 Jun] Available from: http://www.poa.gov.za/news/Documents

Received: 07-10-2016 Accepted: 04-12-2016