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Just How Much Can School Pupils Learn from School Gardening? A Study of Two Supervised Agricultural Experience Approaches in Uganda

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School systems in Africa are short of skills that link well with rural communities, yet arguments to vocationalize curricula remain mixed and school agriculture lacks the supervised practical component. This study, conducted in eight primary (elementary) schools in Uganda, sought to compare the learning achievement of pupils taught using supervised home–gardens and those taught using school gardens. The two gardening groups were tested using a t–test. Data were collected for a period of four school terms using pre and posttest questionnaires, focus group discussions (FGDs), interviews, observations, and a posttest examination. Findings showed no significant difference in knowledge achievement between the two groups of pupils ($p \leq 0.05$), and in parents' attitudes towards school agriculture. Home gardening had a number of additional benefits to pupils, such as personal income and purchase of productive assets like chicken and rabbits from proceeds; food to households; and, independent learning. It is recommended that home gardens should be adopted as a matter of agricultural education policy alongside conventional school gardening in developing countries like Uganda; but further studies are needed to understand constraints in each local situation.

Keywords**:** Africa; vocationalize; curricula; supervised agricultural experience

Introduction

One of the defining characteristics of the U.S. Education system is its diversity and localization of the curricula through area school boards. In Africa, education systems are short of life skills that link well with the needs of rural communities (Vandenbosch, Hagmann, Momoh, & Ngwenya, 2002). However, arguments about inclusion of agriculture in the school curricula have been mixed (Taylor, Desmond, Grieshop, & Subramaniam, 2003). It has been argued that schools can serve as platforms for reaching rural communities with farming innovations through pupils. Skeptics point to past failures, noting that school gardens were often poorly managed, giving rather negative examples to communities (Riedmiller, 2002). It has also been argued that school curricula in Africa are dominated by competitive academic subjects and prioritize terminal examinations over practical skills and contextualized learning.

In 1997, Uganda introduced universal primary (elementary) education (UPE) for all children of school going age (Aguti, 2002). This was followed in 2001 by introduction of a new agriculture curriculum (National Curriculum Development Centre [NCDC], 2000). The new curriculum sought to vocationalize the education system at primary school level in response to the high UPE drop–out rates of nearly 80% (Murphy, 2003). However, five years after the introduction of the agriculture curriculum, it was still uncertain whether pupils actually made significant learning achievements in the subject or applied their school knowledge at home. What was clear is that the teaching approaches lacked a supervised agricultural component which should be the core of agricultural education (Newcomb, McCracken, Warmbrod, & Whittington, 2004). Earlier, experiences in

promoting school agriculture in Sri lanka, Tanzania and other parts of Sub Saharan Africa were largely regarded as discouraging because of poor delivery methods (Taylor et al, 2003). The quality of school gardens was identified as the single most important factor influencing the knowledge, skills and attitudes of pupils studying primary school agriculture (Riedmiller, 2002). In the case of Uganda, school gardening is often simply a labor–based activity that offers few learning opportunities to pupils engaged in it, a majority of whom leave school without employability skills (Kibwika & Tibezinda, 1998; NCDC, 2000; Reidmiller, 2002).

In the United States, Ricketts and Place (2005) reported that experiential learning has long been the foundation of agricultural extension and education both of which emphasize the importance of *learning by doing*. Supervised Agricultural Experiences (SAEs) are central to the experiential learning approach of the American agricultural education system (Cheek, Arrington, Carter & Randell, 1994; Hughes & Barrick, 1993). Arnold, Warner, and Osborne (2006) argued that experiential learning is viewed as a process where a learner constructs knowledge, skills and values from direct experiences. The process requires teachers to change their way of thinking and allows learners opportunities for self discovery learning. Camp, Clark, and Fallon (2000) reported that SAEs provide a number of advantages to students, such as: real–life experiences; encouragement to learn more in class; excitement; a sense of ownership and pride among students; the foundation for vocational education; learning by doing; and learning about agriculture by working with it in the field. Newcomb et al. (2004) also supported the view that supervised agricultural experiences allow students to apply the practices and principles learned in the classroom and to develop new abilities. Roberts, Dooley, Harlin, and Murphrey (2007) noted that successful agricultural science teachers must be capable of facilitating supervised experiences, and have specific competencies in active supervision of student projects. This includes planning and visiting project sites; assisting with student record keeping; and, having personal experience in the types of projects that students undertake.

In this paper, we argue that SAEPs could also be viewed from the perspective of the student development *theory of involvement* used in higher education (Astin, 1999). The theory postulates that the amount of student learning and personal development associated with any educational program is directly proportional to the quality and quantity of student involvement in the program. Although developed for student development in higher education, this theory finds relevance in countries like Uganda which emphasize classroom–based, exam–oriented teaching as opposed to Dewey's pragmatism espoused in the American system. Dewey (2001) emphasized the relationship between education and society. Such pragmatism is illustrated by Camp et al. (2000) who argued that agricultural education in the United States is no longer the business of training farmers as educators grapple with the need to widen the scope and definition of SAEs in light of the new realities and trends in their relatively developed agriculture. In contrast, developing countries like Uganda still emphasize the school gardening (farm project) approach in spite of some advances in agriculture. Astin, (1999) also suggested that for a curriculum to achieve the desired effects, it must elicit sufficient effort and energy on the part of the student in order to bring about the desired learning and development. He pointed out that simply exposing the student to a particular set of courses, as often done with classroom theory, may or may not work.

This point of view underscores the argument that understanding experiential learning–activities requires defining the context in which they are implemented (Roberts, 2006). In the case of primary (elementary) school education in Uganda where 80% of the population lives on land, the context is to expose pupils to concrete gardening experiences through their active participation in order to help them to identify with (gain interest and awareness of) specific farming activities, internalize skills and disseminate information to their parents at home. According to Astin (1999), content–based approaches to teaching — such as the examination driven teaching of agriculture — tend to make students passive as simple recipients of information without the practical involvement needed to encourage skill acquisition and transfer. This study was also based on the proposal by Dormody and Seevers (1994) that students should be encouraged to develop a supervised agricultural experience

program (SAEP), regardless of their backgrounds.

Theoretical/ Conceptual Framework

Experiential learning is the practical component of agricultural training (Newcomb et al., 2004). Figure 1 shows that SAEPs involves application of classroom theory laid out in the curriculum and teachers' schemes of work. What pupils learn in class is applied in SAEPs and supported by club activities through competitions and awards. Therefore, learning achievement and the resultant learning transfer from it depend on the quality of both classroom instruction and SAEPs activities such as school gardening. However, learning achievement at school level and learning transfer to pupils' homes also depend on intervening factors at school and home as well as on the individual characteristics of each learner (Pressley & McCormick, 1995). In other words, implementation of the primary school curriculum is influenced by school factors (A1 and A2) such as: teacher quality; available facilities like land for gardening; and management issues; as well as on learner traits (B1) like: pupils' attitudes; and their willingness to learn.

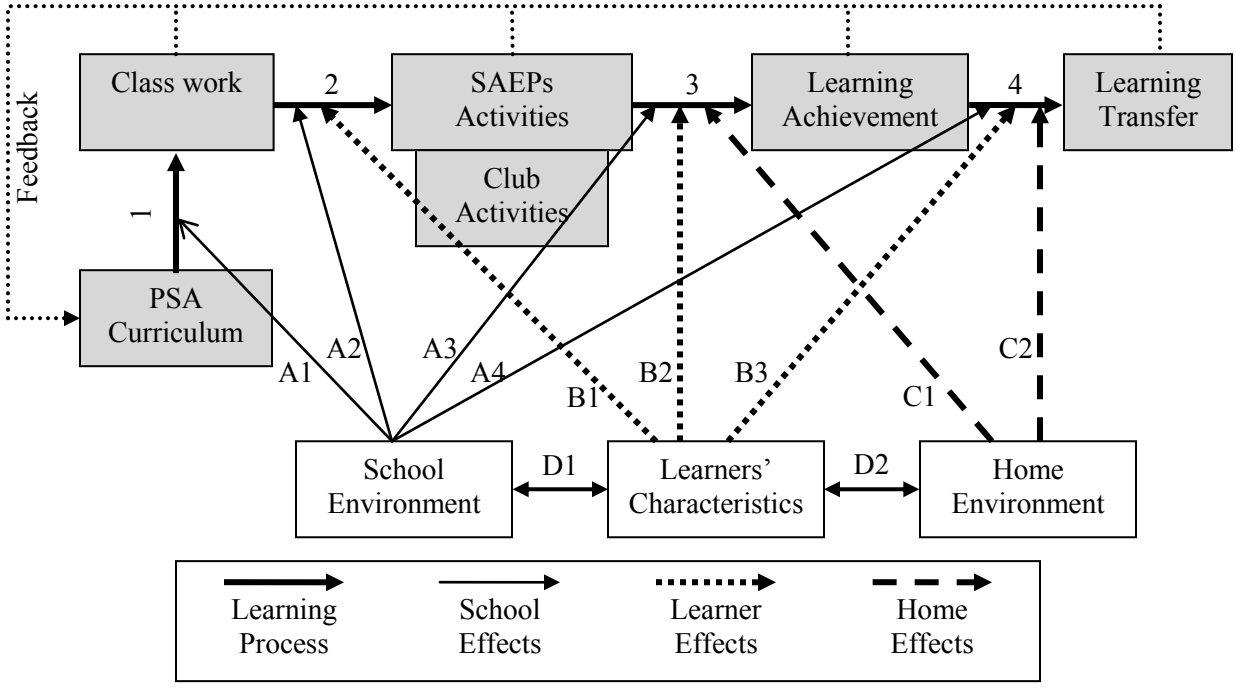

Figure 1. Conceptual framework for learning achievement and transfer under SAEPs

Pupils' learning achievement in class and out–of–class also depends on the school environment (A3), learners' individual characteristics (B2) and their home backgrounds (C1). The learners influence and are influenced by school and home environments (D1, D2); while learning transfer is similarly affected by school (A4), individual (B3) and home (C2) factors. Further review of the school agriculture curriculum is made possible by feedback from pupils' overall performance. Finally, it was hypothesized that pupils' parents are influenced by home–gardening activities involving their children. This was based on an earlier study by Miiro and Orum (2007) which showed that over 90% of parents learned about the vitamin A benefits of Orange–Fleshed Sweetpotatoes from the school gardening activities of their children. This paper discusses the lessons learnt from using supervised agricultural experience gardening projects (SAEPs) at primary school level in Uganda. The lessons could inform the

agricultural education policy and practices in other developing countries.

Purpose and Objectives

The objective of this paper is to discuss the extent to which supervised school gardening enhances learning achievement and transfer in the primary school agriculture curriculum. We examined: (a) The extent to which pupils learn from home–based and school–based supervised gardening experiences; and (b) The effects of the two gardening approaches on parents' attitudes towards school agriculture. In order to answer the above objectives, two null hypotheses were tested, namely: (a) there is no significant difference ($P \leq 0.05$) in the learning achievement between pupils with home–based SAEPs and pupils with school garden–based SAEPs; and (b) there is no significant difference ($P \leq 0.05$) in the attitudes of parents with home gardening children and of parents whose children had gardens at school.

Methodology

This study was carried out between 2005 and 2007 in eight primary (elementary) schools selected from the two districts (Tororo and Kumi) in Eastern Uganda. The study used a longitudinal quasi experimental research design to compare the performance of cohorts of pupils with school–based gardens/SAEPs and pupils with home–based gardens/SAEPs for a period of two years. The quasi experiments were used because schools settings are not suitable for true experimental designs (Fraenkel & Wallen, 2000; Shavelson, 1996). The two groups were similar in all aspects except for; location and proximity of the projects to parents; ownership of the benefits; and the individualized home visits made by teachers to only those with home gardens.

Thirty (30) pupils from primary six (K7) in each school were randomly assigned to two experimental groups using a fish–bowl draw method. One group was allocated plots in the school garden while the second group established their gardening projects at home. All the pupils were given starter seeds supplied by the researcher for vegetable gardening and exercise books for record keeping. The agriculture teachers later made routine visits to pupils with home projects to supervise and give advice (Figure 2) using a bicycle provided for the purpose. The vegetables grown were tomatoes *(Lycopersicon esculentum)*, cabbages *(Brassica oleracea var capitata),* Kale/ S*ukuma wiki (Brassica oleracea var acephala)* and egg plants *(Solanum molengema)*.

Figure 2. Pupil with teacher shows off his home garden to researcher

The quasi experiments were preceded by key informant interviews with district leaders in charge of primary school agriculture; Focus Group Discussions (FGD) with teachers, parents and pupils in each school; and a pretest survey involving questionnaires. A posttest written exam for pupils and posttest questionnaires were administered to the pupils and parents at the end of SAEPs activities. The gardening activities were also collectively evaluated using FGDs

held with the members of the agriculture advisory committees at the end of each school term. Parents' attitudes were measured using pretest and posttest questionnaires containing twenty statements relating to participation of their children in school gardening and to the teaching of agriculture as a school subject. The individual responses to each of the statements were weighted using a five–point likert scale (1 = strongly disagree and 5 = strongly agree) in order to obtain percentages.

The twenty statements regarding school gardening were generated from the FGDs held earlier with parents and administered in questionnaires as follows: whether or not pupils worked for teachers in the school gardens; pupils were overworked in the school gardens; school gardening was part of the pupils' learning; school gardening was a punishment for the pupils; it was not good for pupils to dig at school; teachers forced pupils to work in school gardens; it was okay for pupils to dig for the teachers; pupils dug for teachers yet refused to dig at home; digging at school disturbed the pupils' learning; parents thought gardening only benefited teachers; pupils learned to grow crops through school gardening; it was good for parents to provide seeds and hoes for school gardening; agriculture pays as a business; school gardening helped pupils appreciate farming; school gardening gives all–round education to pupils; pupils did not benefit from school gardening; farming was only useful for people with nothing else to do; school gardening was a waste of pupils' learning time; all schools should have school gardens; and whether parents could learn modern farming from school teachers. In addition to the twenty statements, the questionnaires also sought to establish the gardening activities carried out at school; kinds of home gardening projects owned by pupils; the support received by pupils during their gardening projects; the benefits arising from the projects; knowledge and skills acquired and applied at home by pupils and parents; as well as challenges faced during school or home gardening. The posttest scores on learning achievement between the two gardening groups were compared using a t–test. The test items measured pupils' knowledge of vegetable production skills like soil sterilization, nursery bed preparation, pricking out, hardening off, transplanting, staking, pruning and harvesting.

The content validity of the instruments was determined using a panel of experts consisting of members of the post–graduate committee of the Department of Extension and Innovation Studies at Makerere University. The instruments were also discussed with the academic supervisors. The reliability was determined using a pretest conducted in a non–participating primary school in Tororo district. The alpha coefficients were 0.7183 for teachers' questionnaire and 0.8015 for parents' questionnaire while the split–half coefficients for pupils' questionnaire were 0.24 and 0.77, which indicated they were significantly reliable.

However, the study design did not envisage the long–term learning impacts of SAEPs beyond the home gardens. Nevertheless, its outcomes were considered appropriate for evaluating the learning achievements and transfer of school knowledge, skills and attitudes to home gardens. Secondly, the sample sizes were relatively small ($N < 30$) due to constraints in provision of vegetable seeds and teachers' time for making home visits.

Results and Discussion

Seventy three (73%) percent of the pupils with home gardens reported that they were visited at least twice in their homes by the teachers. In Uganda's context, it is rare for an agriculture teacher to visit pupils' homes on school matters. The results indicated that given the right incentives such as bicycles; and training, primary school teachers in Uganda can find time from their 'busy' schedules to carryout home visits and advice pupils on their home–based gardening activities. The respondents were also asked to report whether or not they learned from the SAEPs approach. Table 1 shows the different ways in which pupils and parents learned from the two gardening approaches.

Table 1
FGD Results of How SAEPs Approach Promoted Learning for Pupils and Parents

Contribution to pupils' learning	Contribution to parents' learning
• Pupils had opportunity to work on their own (self–learning) • Pupils learned to care for full cycle of crop growth/ vegetables • Pupils learned new techniques like Sterilization of nursery soils & care of nursery beds • Pupils practiced what was taught	• Learning was limited to parents of pupils who had home projects • Parents observed children using taught practices: planting, pruning and staking • Parents experienced cognitive dissonance by pupils' actions such as soil sterilization • Parents observed gardening benefits from pupils plots • Parents learned from guided tours of school gardens during school meetings

The results in Table 1 show that SAEPs activities provided opportunities for self – learning as pupils worked on their own projects. The home gardening activities also enabled pupils to observe the full cycle of a crop's growth from the nursery beds to harvesting and marketing. This was unlike school gardening activities which were often interrupted by holidays. Other gardening benefits reported (Table 2) included: opportunities for pupils to put into practice what the teachers taught to them in class; pupils' vegetable produce used as food to households; and, cash income earned from the sale of the vegetables.

Table 2
Most Important Benefit Pupils Got from SAEPs Activities

	Pupils (n = 208)		Parents (n = 184)	
SAEPs Benefit to pupils	Frequency	Percentage	Frequency	Percentage
Vegetables growing knowledge & skills	137	65.9%	115	62.5%
Vegetables eaten by family members	18	8.7%	47	25.5%
Money from sale of vegetables	39	18.8%	9	4.9%
Seeds given by the school	6	2.9%	2	1.1%

The results in Table 2 show that acquisition of knowledge and skills for vegetable growing was the most important benefit of pupils' participation in SAEPs gardening activities. This is in contrast to other studies reporting limited skills accruing to pupils (Kibwika & Tibezinda, 1998). Figure 3 below shows the specific kinds of knowledge on vegetable gardening reported by the pupils.

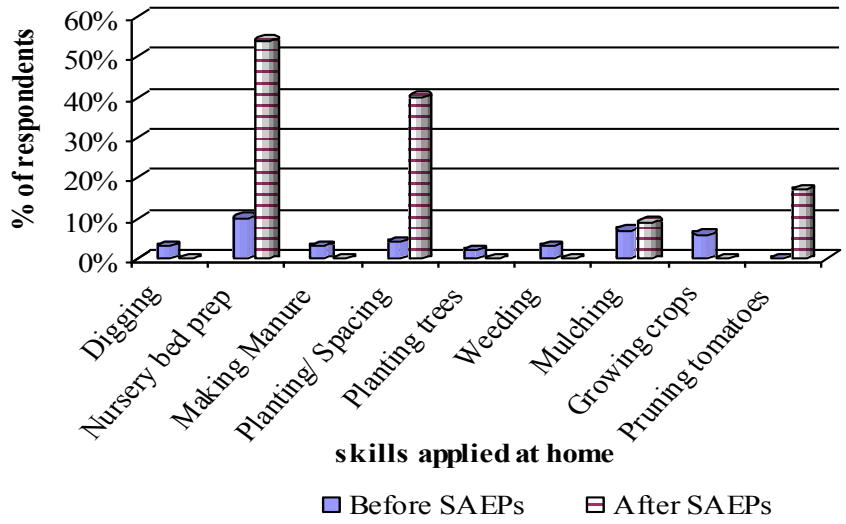

*Figure 3***.** Kinds of knowledge and skills applied by pupils before and after the SAEPs

The results in Figure 3 show the specific skills reported before and after introduction of SAEPs. The results show that the number of pupils reporting specific gardening skills increased after SAEPs than they did before. Generally, the SAEPs approach led to higher learning achievement and learning transfer to pupils' homes, particularly where teachers set up quality demonstrations at school for pupils to learn from. Table 3 shows the results of the t–tests used to compare knowledge of vegetable production between the school–based and the home–based gardening groups.

Table 3
T–test Results for Mean Scores of Pupils with Plots at School and Plots at Home

School	Group	*N*	Mean	SD	df	t–value	t–critical	P–value
A	School	15	37.3	11.6	28	0.92	2.048	0.927
	Home	15	36.9	12.2				
B	School	15	50.0	16.5	28	2.988	2.048	0.006
	Home	15	33.3	14.0				
C	School	15	50.3	12.6	28	1.211	2.048	0.236
	Home	15	44.7	13.0				
D	School	15	37.7	12.0	28	0.944	2.048	0.353
	Home	15	33.3	13.5				
E	School	15	50.0	12.5	28	1.054	2.048	0.301
	Home	15	44.7	15.1				
F	School	15	39.3	12.8	28	0.621	2.048	0.540
	Home	15	36.8	9.3				
G	School	15	47.3	11.6	28	2.596	2.048	0.015
	Home	15	36.9	10.3				
H	School	15	50.7	8.3	28	2.812	2.048	0.009
	Home	15	41.9	8.8				
Overall	School	120	42.7	13.3	238	0.824	1.960	0.411
	Home	120	41.2	13.5				

Note. Results were significant $P \leq 0.05$; two tailed tests; H_o rejected when t–value $\geq$ t–critical

The t–test results in Table 3 show that the differences were significant ($P \leq 0.05$) in only three (B, G and H)out of the eight schools. In all cases, however, pupils with plots in the school gardens on average performed better (higher mean scores) than their counterparts with plots at home. The results were not significant when all the group scores were aggregated ($P \leq 0.05$). Since there were no significant differences in five out of the eight schools; and when all the

groups are aggregated, the null hypothesis was not rejected.

Ideally, the t–test assumes random sampling of scores and normal distribution of scores in the population ($N \geq 30$). Definitely, 15 pupils per group violated the assumption of normality. However, for samples of $N \geq 15$, such violation does not appreciably affect the outcome of a statistical test (Shavelson, 1996). On the other hand, the use of the Mann–Whitney U test based on ranked scores would be affected by too many ties between groups on a written test as used above (Shavelson, 1996). The t–test was therefore, the best tool for comparing small samples, albeit with a lower statistical power at $N < 30$. Based on the conclusion that there was a no significant difference in the learning achievement of the two gardening groups, a simultaneous application of the two approaches should be encouraged. Table 4 shows the t–test results of attitudes of parents of the two gardening groups towards school gardening and teaching of agriculture as a school subject.

Table 4
T–test Results for Attitudes of Parents with Home and School–Based SAEPs

Groups	N	Means	SD	Std Error	df	T–value	t–critical	P–value
School	64	76.17	12.06	1.51	134	0.469	1.960	0.640
Home	73	75.17	12.85	1.51				

Note. Significant at the 0.05 level (2–tailed); H_o rejected when t–value $\geq$ t–critical

The results showed that there was no significant difference ($P \leq 0.05$) between the attitudes of parents of home–gardening children and of parents whose children had gardens at school. Therefore, a null hypothesis (H_0) that *"there was no significant difference in parents' attitudes"* was retained. These results show that parents' attitudes were not necessarily affected by the close proximity of home gardens as expected. The home gardens generally lacked the accompanying inputs; particularly the lack of pesticides since parents expected them to be supplied by the schools, which gave seeds to pupils in the first place.

Overall, the school gardening groups consistently did slightly better (higher mean scores) than those with home gardens. This was because teachers' time and support offered to the groups favored the school gardening pupils. This confirms that the key feature in using SAEPs is supervision (Dyer & Williams, 1997; Newcomb et al. 2004). Thus, the low performance of the home gardening groups was attributed to the weak one–on–one instruction by teachers during supervision visits. This led to lack of the resultant incremental learning advantage which was expected to occur during home visits. The teachers had little time for such visits. They reported being overwhelmed by large numbers of pupils to visit; and were not very skilled in supervising home projects. This meant that pupils planted and tended the crops on their home gardens with little guidance from their teachers beyond what was already taught at school.

However, the qualitative findings from the participatory evaluation of SAEPs in FGDs with members of Agricultural Advisory Committees at each school revealed that home gardens had a number of additional benefits. These included: providing pupils with opportunities for self–learning; helping pupils to observe full growth cycles of the crops grown; direct benefits to individual pupils such as money and food to households; and in some schools, home gardens were better than school gardens. Contrary to earlier studies on vocationalisation of the primary school curricula in Sub Saharan Africa (Psacharopoulos, 1990), our findings showed that primary school pupils in standard six were cognitively mature enough to participate in SAEPs' self–learning activities and learn useful skills in modern farming, which can be applied in their villages both during and after school. Interference to the classroom timetables involving the 3Rs was minimized by scheduling

gardening in early mornings before classes begin.

Conclusions

In conclusion, this study gives a further justification for inclusion of agriculture in the school curricular, especially in less developed countries like Uganda. In particular the findings showed that the SAEPs method enhanced pupils' learning achievement and learning transfer from school to pupils' home farms. Although there was no significant difference in pupils' knowledge achievement between the two gardening groups, the home gardening approach provided opportunities for pupils to practice what they learnt at school and in their own homes. In spite of the minimal role played by teachers in visiting and advising pupils, the home–gardening approach demonstrated a number of additional benefits for both pupils and their parents such as food for households, income and purchase of other productive assets like chicken and rabbits. Such assets purchased by pupils could form the basis for further research on individualized SAEPs enterprises.

The findings also showed that there was no significant difference in the attitudes of parents of pupils taught using the two gardening approaches. Parents with school gardening children had more favorable attitudes (mean scores) compared to those with home gardens. In the latter case, attitudes were affected by the dismal work done by teachers and the lack of critical inputs like insecticides which affected the outcomes of pupils' projects. A participatory approach involving parents during the planning process may help to address the attitudinal problem through shared ownership of the gardening programs.

Recommendations/ Implications

Based on these findings, we recommend that home gardening should be used alongside conventional school gardens as a matter of the agricultural education policy in Uganda and other less developed counties in the region. The agriculture curriculum should be reviewed to include the practical experiential component carried out in pupils' homes. However, agriculture teachers should be given specialized training on the SAEPs method and incentives in order for them to effectively advise pupils on a one–on–one basis during home visits.

In addition, since parents' attitudes were to some extent dependent on the gardening approach used by their children, a participatory approach involving all stakeholders (school administrators, local government leaders and parents) should be used to improve planning and overall quality of instruction by increasing support to pupils' gardening projects. Local government leaders at district and sub–county levels can help sponsor school gardening projects in their areas by incorporating school projects in their financial budgets.

The findings also showed that pupils with home gardens purchased other productive assets from gardening proceeds. These assets could be the basis for further research on development of SAEPs beyond home gardening and follow–up support to pupils, even when they drop out of school. Further research is also needed to determine SAEPs' application in non–crop aspects of the curriculum and; use of home gardens for other parts of the country; as well as validation of the SAEPs gardening model for other developing countries in the region.

References

Aguti, J. N. (2002, July). Facing up to the challenge of universal primary education (UPE) through distance teacher education programs. *Paper presented at the Pan Commonwealth forum on open learning: Transforming education for development*, Durban, South Africa. Retrieved from: http:www.col.org/PCF2/papers%5Caguti.pdf

Arnold, S. , Warner, J. W., & Osborne, E. W., (2006). Experiential learning in secondary agricultural education classrooms. *Journal of Southern Agricultural Education Research, 56*(1). Retrieved from: http://www.jsaer.org/pdf/vol56/56-01-030.pdf

Astin, A. W. (1999). Student involvement: A developmental theory for higher education. *Journal of College Student Development, 40*(5), 518–529.

Camp, G. W., Clarke, A., & Fallon, M. (2000). Revisiting supervised agricultural experiences. *Journal of Agricultural Education, 41*(3), 13–22. doi: 10.5032/jae.2000.03013

Cheek, J. G., Arrington, L. R., Carter, S., & Randell, R. S., (1994). Relation of supervised agricultural experience program participation and student achievement in agriculture. *Journal of Agricultural Education, 35*(2). 1-5. doi: 10.5032/jae.1994.02001

Dewey, J. (2001) *The School and Society: the child and the curriculum*. Unabridged re-publication, Mineola, NY: Dover Publications Inc.

Dormody, T. J., & Seevers, B. S. (1994). Participation of FFA members in leadership development activities: A tri–state study. *Journal of Agricultural Education, 35*(4), 42–48. Retrieved from: http://202.198.141.77/upload/soft/001/35-04-42.pdf

Dyer, J. E., & Williams, D. L. (1997). Supervision of agricultural experience programs: A synthesis of research. *Journal of Agricultural Education, 38*(4), 59–67. doi: 10.5032/jae.1997.04059

Fraenkel, J. R., & Wallen, N. E. (2000). *How to design and evaluate research in education*. New York, NY: McGraw–Hill Company Inc.

Hughes, M., & Barrick, R. K. (1993). A model for agricultural education in public schools. *Journal of Agricultural Education, 34*(3), 59–67. doi: 10.5032/jae.1993.03059

Kibwika, P., & Tibezinda, J. P. (1998). Participation of youth in agriculture in Iganga District. *MUARIK bulletin. 1*(1), 1–5.

Miiro, R., & Orum, B (2007). Reaching Urban Communities through Schools: A case of the Orange–Fleshed Sweet Potato Project in Kampala, Uganda; In Mangheni, M. N. (Ed.), *Experiences, Innovations and Issues in Agricultural Extension in Uganda: Lessons and Prospects.* Kampala, Uganda: Fountain Publishers.

Murphy, L. (2003). Does increasing access mean decreasing quality? An assessment of Uganda's progress towards reaching education for all (EFA) goals. *A background paper for EFA monitoring.* Kampala, Uganda: Ministry of Education and Sports

National Curriculum Development Centre, [NCDC]. (2000).*Uganda primary school curriculum, (Vol. II).* Kampala, Uganda: National Curriculum Development Centre.

Newcomb, L. H., McCracken, J. D., Warmbrod, J. R., & Whittington, M. S. (2004). *Methods of teaching agriculture.* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Psacharopoulos, G. (1990). Why educational policies can fail: An overview of selected African experiences. *World Bank Discussion Paper # 82.* Washington, DC: The World Bank, African Technical Department Series

Pressley, M., & McCormick, C. B. (1995). *Advanced educational psychology for educators, researchers, and policy makers.* New York, NY: Harper Collins Publishers

Ricketts, K. G., & Place, N. T. (2005). Cooperation between secondary agriculture educators and extension agents. *Journal of Extension*, *43*(6), # 6FEA6. Retrieved from: http://www.joe.org/2005december/a6p.shtml

Riedmiller, S. (2002). *Primary school agriculture: What can it realistically achieve?* Retrieved from http://www.fao.org/sd/2002/KN0701a_en.htm

Roberts, T. G. (2006). A philosophical examination of experiential learning theory for agricultural educators. *Journal of Agricultural Education, 47*(1), 17–29. doi: 10.5032/jae.2006.01017

Roberts, T. G., Dooley, K. E., Harlin, J. F., & Murphrey, T., (2007). Competencies and traits of successful agriculture science teachers. *Journal of Career and Technical Education, 22*(2). Retrieved from: http://scholar.lib.vt.edu/journals/JCTE/v22n2/pdf/roberts.pdf

Shavelson, R. J. (1996). *Statistical reasoning for behavioral sciences* (3rd ed.). Boston, MA: Allyn and Bacon.

Taylor, P., Desmond, D., Grieshop, J., & Subramaniam, A. (2003). Using gardens, farms and forests as learning laboratories to benefit schools. Making learning relevant: principles and evidence from recent experiences. In D. Atchoarena, & Gasperini, L (Ed.), *Education for rural development: Towards new policy responses* Rome, Italy: FAO and UNESCO International Institute for Educational Planning.

Vandenbosch, T., Hagmann, J., Momoh, C. & Ngwenya, H. (eds). (2002, May). *Round–table discussion on the Farmers of the Future.* Nairobi, Kenya: World Agro–forestry Centre (ICRAF).

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