



Education for Sustainable Development in Agriculture at Primary Schools

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Abstract Even a small plot or container garden applying sustainable agriculture can help children learn basic ecological principles. In urban living, a garden maybe the best connection for young people to nature; especially it may affect to their community, making the connection between suitable agriculture and their parents or their future activities. The study was conducted to access the perception of school children at primary school through the series of training provided towards sustainable agriculture and environmental education. Series of training were delivered to school children selected from five primary schools: two from Prey Chhor district, Kampong Cham province and other three from Phnom Penh. Totally, there were about 200 children that participated from the selected primarily schools in each training. Before and after the training provided, as well as interviews at each step, the understanding of school children on sustainable agriculture and environment was evaluated; the results showed that the understanding of composting materials were increased, also the perception and the motivation increased with the training including practical demonstration. Noticeably, after the training on compost making, school children had learned the ways of how the compost is made and what the chemicals meant to them and their communities. We also observed that a number of school children started to collect the organic materials for their school's compost boxes. Moreover, the results from their vegetable gardening gave evidence that the understanding of school children on agriculture and environment was increased and it was applicable to their villages and the communities close to their places. Based on the findings obtained and our observation, the series of training on sustainable agriculture and environment to school children at primary schools are effective to the rural villages for their livings and income generation. This may be also helpful to the community effort in sustainable agriculture and environment as a whole.

Keywords food safety, trained and non-trained pupils, knowledge transferring

INTRODUCTION

The effort towards the environment and sustainable agriculture has to involve all people in the community, experts and policy maker. Childrens knowledge on the subject plays an important role

by influencing the daily life and farm practices of their parents as well as their future activities. Even though, farmers still using chemical fertilizers and pesticides in farmlands to increase agricultural productivity. The application of chemical fertilizers and pesticides in developed countries and developing countries have been causing serious environmental problems for some time (Mihara and Fujimoto, 2007). Educators focused on schooling for sustainability, a vegetable garden is the best starting place. Children can care for other living things, learn ecological principles, experience the joy of nature, make connections between science and social studies and use all their senses, thus pupils will know the balance between living and surviving through a hands-on relationship with another living organism. Students gain a better understanding of how gardening and farming practices affect the environment, and how they can improve both soils and the quality of their food (Biological Farmers of Australia, 2009). It is a way to understand an educational process on a daily basis (Center for Ecoliteracy, 2004-2011). To conclude, the topic of this study is to investigate the children's acceptance of knowledge on sustainable agriculture and environment.

METHODOLOGIES

The study was conducted at 6 primary schools and was divided into two groups, the first (ReseySai, Prey Veng and Prey Sar) was accepted the training about sustainable agriculture and environment since 2006 until 2011, and the second (Prek Speu, Toul Rokakos and Tro Pangsela) was not accepted. These schools are located at the edge of Phnom Penh city, Prey Sar and Prey Veng commune, Dang kor district, Cambodia. These areas are capital cities of Cambodia and it has a largely free land to conduct agriculture. So people here can be called farmers. There were 363 pupils from six primary schools interviewed using structured questionnaires. Among them, 164 joined the training courses whereas the rest did not. Key questions were applied with the students are: the pupils acceptance of the knowledge of agriculture and environment; how this important knowledge for the pupils thinking, and how the pupils can be in the core play role of extension? During the study, some experimental materials were also provided by the trained schools, were seeds, compost boxes, and organic gardens.

RESULTS AND DISCUSSIONS

Rehabilitation and sustentation of the agriculture and environment, using the sustainability of natural resources, and reflecting very clearly on a good environment, explaining to farmers and pupils to understand the importance of agriculture is a measure in the conservation work. Practice of the organic agriculture was increased through creating a series of compost centers, model organic farming and training courses. Based on the study, the range of pupil's age is from 11-15 years old. The pupils are the future guardians of the world. Sharing the knowledge will provide the younger generation with the skills and they need to face the challenges of producing delicious and healthy food. There are many workshops at the trained school, namely: water quality control, agricultural land improving, planting technology, compost making and bio-extract making. Depending on the training of materials for making compost (Fig. 1), the trained group can make compost by themselves; they can practice at their house which opposite from the non-trained group.

Knowledge on suitable agriculture and environment shown in table 1, notified that the trained pupils have a high acceptance of agro-forestry, mixed cropping, rotation crop, benefit from using organic fertilizer and bio-extract (97%), whereas the non-trained pupils accepted the 26%. In addition to this, the trained pupils can get a lot of experiences about crop technology related soil quality by enjoying organic farming with their hand-plantings.

Beside the materials for making compost, each step for making fertilizer is also important (Table 2). Digging a pit or building a compost box, putting plant residues in the pit or compost box as a layer, putting farmyard manure in the pit or compost box alternative with plant residues layers, pouring water until the materials become moist, covering the pile with plastic or thatch to protect from rainfall, and mixing the materials in the pit every week are the necessary knowledge for how

compost can be made. The trained students gave the best answers, whereas the non-trained students even though chose the right answers it was limited.

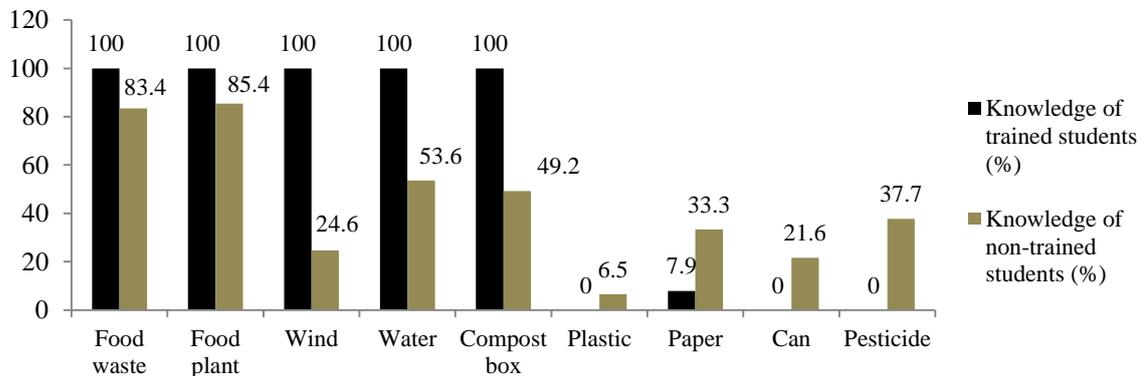


Fig. 1 Materials for making compost

Table 1 General education on suitable agriculture and environment

| Description | | Agro-forestry | Mixed crop | Rotation crop | Benefit from using organic fertilizer and bio-extract |
|---|-----|---------------|------------|---------------|---|
| Understanding of trained students (%) | Yes | 95.1 | 95.7 | 98.8 | 100 |
| | No | 4.9 | 4.3 | 1.2 | - |
| Understanding of non-trained students (%) | Yes | - | 18.1 | 16.1 | 26.1 |
| | No | 100 | 81.9 | 83.9 | 73.9 |

Table 2 Each step for making compost

| Each step for making compost | Understanding of trained students (%) | Understanding of non-trained students (%) |
|--|---------------------------------------|---|
| Dig a pit or build a compost box | 100 | 100 |
| Put plant residues in the pit or compost box as a layer | 100 | 94 |
| Put farmyard manure in the pit or compost box alternative with plant residues layers | 100 | 86.4 |
| Put stone in the pit or compost box | - | 30.2 |
| Pour water until the materials become moist | 100 | - |
| Pour water until the materials become soaking wet | - | 100 |
| Cover the pile with plastic or thatch to protect from rainfall | 100 | 44.7 |
| Mix the materials in the pit or compost box every week | 93.3 | 48.2 |

In addition to this, the trained group added that farmers should reduce the use of chemical fertilizer (100%) and use organic fertilizer instead of (100%) because when they apply organic fertilizer to the crop, there is no concern to their health. And non-trained group responded that reducing of chemical fertilizer will cause crops not growing well (81.9%). Moreover, 54% of the non-trained group answered that the application of chemical fertilizer will improve soil fertility while 93% of trained group mentioned that soil fertility will be degraded. Regarding to varieties of insect (for diversity of insect pest), the non-trained group showed that it is increase (65.3%), and the trained group also showed that it is decrease (93.3%). However both groups stated that it is not difficult to reduce the application of chemical fertilizer. This result can express that the trained group is easy to understand about disadvantage of chemical fertilizer while more higher understanding than the non-trained group. Acknowledgement of chemical disadvantage should be the best education for all people; it can lead farmers to lessen the amount of chemical fertilizer, and it can encourage customers to think about food safety. Relating to the effect of environmental pollution on public health, the trained group understands the effect whereas non-trained group only 54% of them understands. To reduce the amount of organic waste, recycling the waste into other materials is a main solution like recycling organic wastes into organic fertilizers. Farmers can apply organic fertilizers or compost fertilizers to the field to build a good soil quality and can bring the

food safety as well as the fresh environment. The farmers can have more benefits when they apply organic fertilizers because there is no need of much money like with chemical fertilizers, and all farmers can also learn how to produce high quality of organic fertilizer by themselves easily. Therefore, basing on safety feeling of using organic fertilizers, 100% from the trained students have a very strong confident on safe fertilizer because many theories were provide, it is an essential idea to promote their thinking at the present and in the future. Only 38.2% from the non-trained students have safety feeling. This understanding of organic fertilizer of non-trained students was got from outsides, including their families, friends and neighbors. The best information brings them to understand a lot about conservation of suitable agriculture and environment. The rest of non-safety feeling 61.8%, since they did not get a lot of information about a good practice of sustainable agriculture and environment so they always think if they apply organic fertilizer, the crop's yield will be decreased and will be also destroyed strongly from insect pest very quickly. Particularly, increasing the amount of trees around the house, school and community are very interested from trained students (100%) and non-trained students (55.8%). The reason is because; they can derive many benefits from the tree such as flood, building a house or making equipment, providing the shade and fresh air, especially the residue of the trees like leaves, bark or branch can be made into organic fertilizers as well. 44.2% the rest from non-trained students, they do not want to increase the trees. The reason when there are a lot of amounts of trees, it can cause the surrounding area dirty almost everywhere that can damage to environment and it can cause the serious accident. Futhermore, beside studying in the class, both trained and non-trained students also got the agricultural and environmental knowledge from outside (Fig. 2), were as followed: parents, teachers, classmates, friends at the schools, neighbors, NGOs, and the government. Even if the students can get the knowledge from outside, it is very limited. It means only sometime the students were involved; it is not like taking a class regularly.

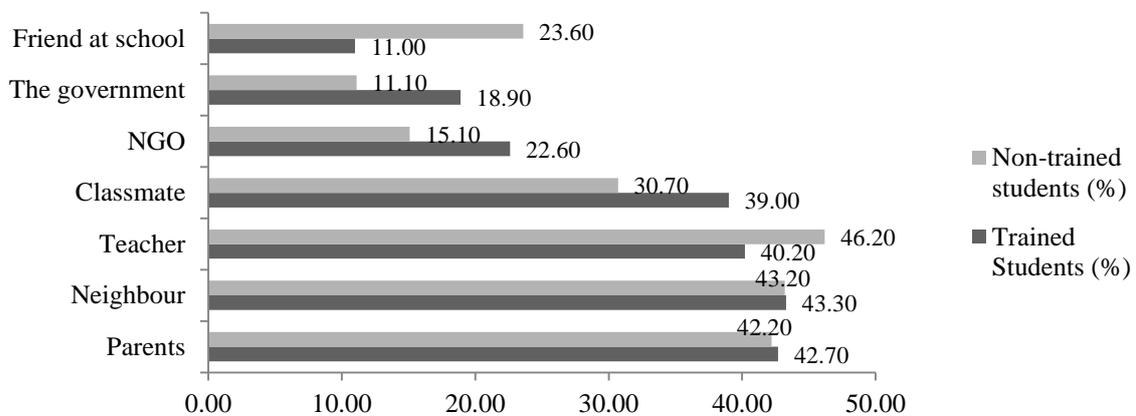


Fig. 2 Students knowledge on agriculture and environment getting from outside schools

Importantly, publishing books of agriculture and environment are also a main way to involve people especially students to learn the news and concerned issues in over the world. According to (Fig. 3) some students always do many researches by reading books in the school's library but some rarely and some never to read. Even though, the amounts of the trained students on book reading still bigger than the non-trained students.

After finishing the training, many trained students can conduct their own practices through learning and only a small amount could not because they are rare to join the training caused by supporting their parents for farm work. So they could not follow the lessons like the others (Fig. 4).

Encouraging people to understand the sustainable agriculture and environment through training series such as how to create appropriated practices, showing all difficulties related to any failure of applying the pollution on agriculture and environment and expressing clearly the benefit on sustainable agriculture, were focused as the most benefits for life skill from the trained students reason (Fig. 5).

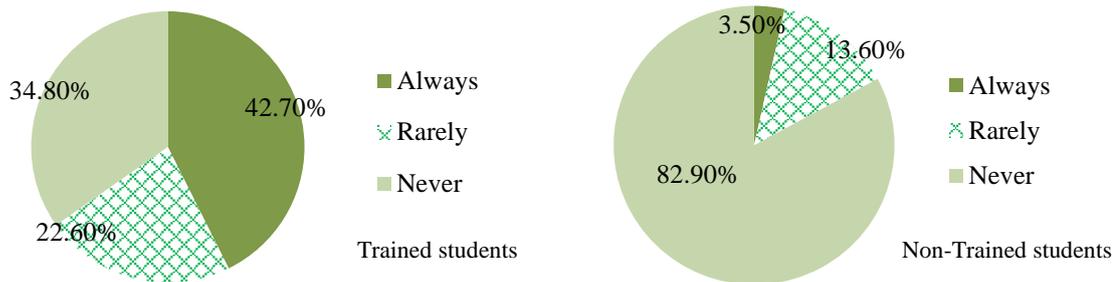


Fig. 3 Amount of students for reading books on agriculture and environment

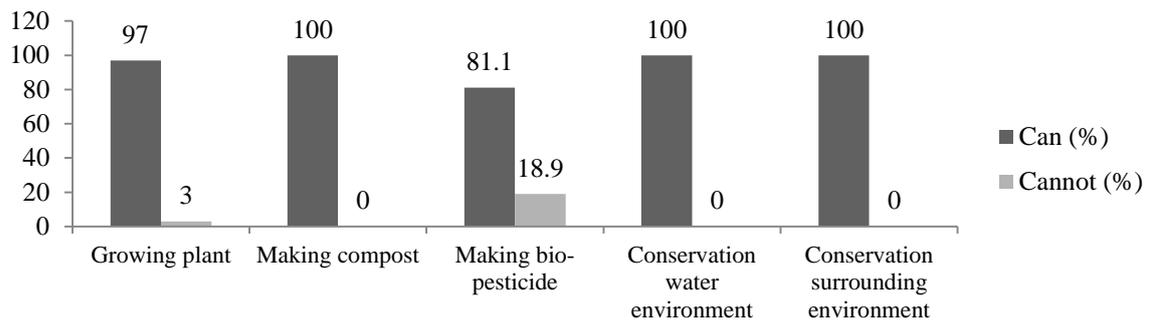


Fig. 4 Visibility of the trained students' practice after training

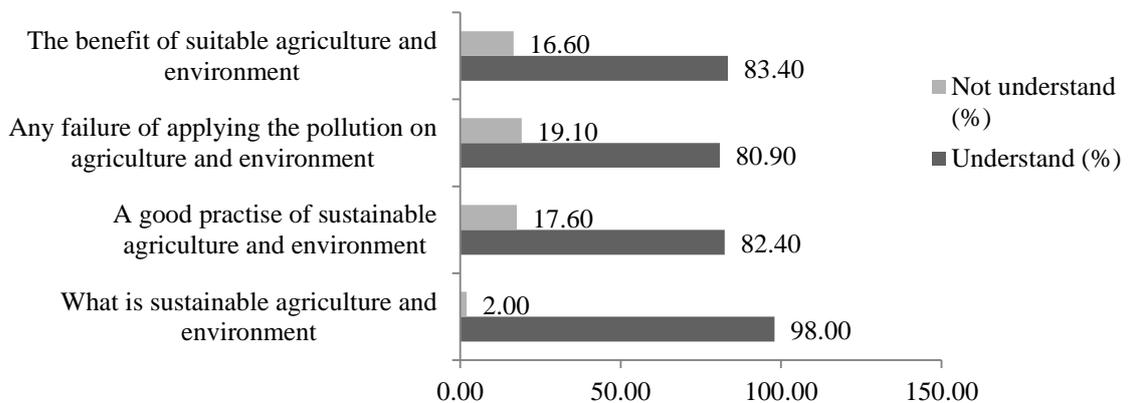


Fig. 5 Understanding of the trained students through training series

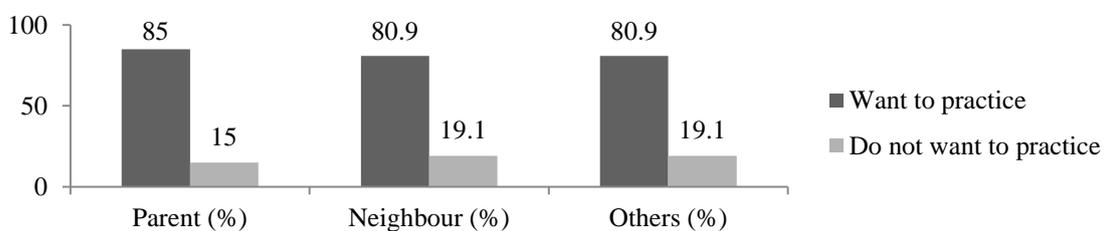


Fig. 6 Transferring of appropriated agriculture and environment to involvements

Many advantages derived from the training series not only provide the student knowledge, but also provide benefits indirectly to the student's parents or neighbors (Fig. 6). However, there is still limit of transferring because some involvements understood it takes time and it could not absolutely make a competition with foreign products.

Indeed, relying on the questionnaires of the trained students, there are many problems were occurred around people living area, they are water pollution, infertile productivity, air pollution, lacking of food safety and suitable agriculture. There are differences between before and after the training. After testing before training, it was explain there is only a little understanding on sustainable agriculture and environment for the trained students, and the understanding subjects in the interest of testing the children, namely: making compost (18.9%), sustaining water environment (18.3%), and sustaining surrounding environment (26.8%). Therefore, after training the students are really most understand and they can almost absolutely practice all the knowledge by themselves, especially they are a part of human resource and responsible for transferring this knowledge to the involvements.

Finally, the purpose of both groups, they would like to have a vegetable garden for their schools because they can improve planting crops, making compost fertilizer, making bio-extract, and they can have fun with their garden and learn new skills. The vegetable garden plays an important role to integrate the garden into the curriculum, including garden-based social studies. It encourages classroom teachers to participate with their students in the garden, especially to invite the local community to join together for growing plants year-round and can promote more and more the knowledge of sustainable agriculture and environment to the local community.

CONCLUSION

The trained pupils understood well about conservation of agriculture and environment, but non-trained pupils had a limit. All the pupils are very happy to join the program because they can learn and practice using of natural resource to get sustainability, and reflecting clearly of a good condition for environment. This study is very essential for pupils because it is a way to teach them to have a closely relationship with appropriated agriculture and environment in their future. Both groups would like to have organic vegetable garden for their school because they can enjoy with their garden and learn new skills. It is concluded that, there is still limited knowledge of the pupils on environmental and sustainable agriculture. They should be trained on the subject through formal educations, providing ready materials, practices and study tours.

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