WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Agricultural Activities Implemented in Secondary Schools Relative to Food Security: A Systematic Literature Review

Cherry Love B. Montales*

Central Bicol State University of Agriculture, San Jose, Pili, Camarines Sur, 4418, Philippines

A B S T R A C T

Agricultural activities in schools are important in addressing issues like food security, health, and environmental sustainability. This systematic review analyzed 25 peer-reviewed studies published between 2014 and 2020 to explore how agricultural programs are implemented in secondary schools. The review used clear inclusion and exclusion criteria and applied thematic analysis to identify key findings. Results showed that school gardens, often combined with other activities, were the most common initiatives. These programs were implemented with the involvement of students, teachers, parents, and other stakeholders, emphasizing the importance of collaboration. The key themes identified include health and nutrition, food security, teaching, environmental sustainability, learning, and the use of information and communication technology (ICT). These findings highlight the broad impact of agricultural activities in schools. In conclusion, involving stakeholders improves the effectiveness of school-based agricultural programs. It is recommended that schools work closely with parents and communities, integrate agriculture into lessons, and use technology to make farming more engaging for students. These actions can strengthen the role of agriculture in education and promote sustainability.

Keywords: systematic review of literature, *Gulayan sa Paaralan*, agriculture, school garden, food security

1. Introduction

The United Nations (2020) reported that nearly 690 million people worldwide are hungry, which accounts for 8.9% of the global population. This number has increased by 10 million people in just one year and by nearly 60 million in five years, highlighting the growing challenge of food security. Hunger and malnutrition are complex global issues that affect economic stability, health, and overall well-being. Recognizing this, the United Nations established Sustainable Development Goal (SDG) #2, which aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture.

Agriculture plays a vital role in achieving food security, especially in developing countries where many communities rely on farming for their livelihood and sustenance (FAO, 2019). School-based agricultural programs, such as school gardens, have gained attention as practical ways to address hunger and malnutrition. These initiatives also provide opportunities to teach students about sustainable agriculture, nutrition, and environmental stewardship (Shrestha et al., 2020). In the Philippines, the *Gulayan sa Paaralan* (School Garden) program exemplifies this approach, combining agricultural education with practical gardening activities to improve food availability and teach valuable life skills (Molijon & De La Rama, 2014).

Despite these efforts, there is a noticeable decline in interest among the youth in agriculture as a career or livelihood option. This trend threatens the sustainability of food production and rural development in agricultural countries like the Philippines. Encouraging students to engage with agriculture early—through secondary school programs—can help address this issue by fostering an appreciation for farming and its role in food security (Rosales, 2019).

This study reviewed agricultural activities in secondary schools worldwide to understand their impact on food security, health, and nutrition. The findings aim to guide agricultural universities in extending their technologies and support to secondary schools, ultimately reigniting the agricultural spirit among the youth. The study also explores how integrating agricultural activities into education can address food security challenges while promoting sustainability and environmental awareness.

2. Methodology

This study utilized a systematic review to analyze existing research on agricultural programs and activities implemented in secondary schools. A structured process was followed, adapted from the guidelines of Badger et al. (2000). The first step involved defining the problem and setting inclusion and exclusion criteria. The review focused on studies related to agricultural activities in secondary schools, particularly those addressing food security, nutrition, and agricultural education. Only peer-reviewed articles published between 2014 and 2020 were included, while studies focusing solely on elementary schools, higher education institutions, or community agricultural programs were excluded.

Next, a comprehensive search strategy was employed to identify relevant studies. Keywords such as "agricultural activities in secondary schools," "school gardens," "*Gulayan sa Paaralan*," "agricultural education," and "food security" were used to search for peer-reviewed articles in databases like Google Scholar. These studies were then evaluated based on their relevance to the topic, emphasizing agricultural activities such as crop and livestock production, their integration into education, and their impact on nutrition and food security. The review also considered the settings and respondents of the studies, including secondary schools, teachers, students, and parents.

Data extraction followed a systematic approach, with key information from each study organized into a matrix format. This included details on the types of agricultural activities, methods of implementation, and observed outcomes. The data were then analyzed using thematic analysis, as outlined by Clarke and Braun (2013). This process began with familiarizing with the data by thoroughly reviewing the extracted information. Significant concepts were highlighted, and initial codes were generated. These codes were grouped into broader themes, which were carefully reviewed to ensure they accurately represented the data. Each theme was then defined and labeled to reflect its core focus, and the findings were summarized in tables and narratives.

To further support the analysis, the frequency of each identified code was manually counted and tabulated, highlighting the most common areas of interest in the reviewed literature. Themes such as health and nutrition, food security, and the integration of agriculture into teaching emerged as key areas of focus in the agricultural programs.

2.1 Inclusion and Exclusion Criteria

The study focused on peer-reviewed research articles that examined agricultural activities implemented in secondary schools. Only articles addressing topics such as agricultural programs and food security were considered. Studies published between 2014 and 2020 were included to ensure the findings were relevant and up-to-date. The review prioritized research that discussed specific agricultural activities like crop and livestock production, gardening programs, and their integration into education and nutrition initiatives.

However, studies that exclusively focused on elementary schools or higher education institutions were excluded. Similarly, community-based agricultural activities, such as home gardens or broader community initiatives, were not considered part of this review. These inclusion and exclusion criteria ensured that the study maintained a clear focus on agricultural programs within secondary school settings and their contributions to food security and educational outcomes (Badger et al., 2000; Clarke & Braun, 2013).

2.2 Literature Search

The literature search was conducted using electronic databases to locate peer-reviewed journal articles. Google Scholar was the primary platform utilized, as it provides access to a wide range of academic publications across various disciplines. Journals in fields such as education, social science, agriculture, nutrition, and health were prioritized for inclusion.

To identify relevant studies, specific keywords were employed, including "agricultural activities in secondary schools," "school gardens," "*Gulayan sa Paaralan*," "agriculture and education," "school nutrition," "agricultural education and extension," and "food security." This targeted search strategy enabled the identification of diverse studies from different regions and contexts, ensuring a comprehensive understanding of the topic (Rosales, 2019; Shrestha et al., 2020).

2.3 Criteria for the evaluation of the studies

To evaluate the relevance and quality of the studies included in the review, several criteria were established:

- The agricultural programs or activities discussed in the literature must relate to crop and livestock production, food consumption, and the role of agriculture in supporting nutrition.
- The setting of the studies had to be secondary schools, specifically in the Philippines or other countries that implement school-based agricultural activities.
- The subjects of the studies were required to include junior and senior high school students, teachers, school administrators, and parents of high school students.
- These criteria ensured that the review focused on studies that directly addressed the role of agricultural programs in secondary schools and their broader impact on education, nutrition, and food security (FAO, 2019; Molijon & De La Rama, 2014).

3. Findings and Discussion

The various agricultural programs/activities implemented worldwide as reflected by the reviewed studies, their classifications, and areas of interest will be discussed in this area.

3.1 Agricultural Programs/Activities Implemented worldwide

Table 1 presents a summary of the agricultural programs and activities implemented worldwide, as discussed in 25 pieces of literature. Most of the studies focused on secondary school programs, but six studies also included elementary and kindergarten settings to provide a broader perspective (Molijon & De La Rama, 2014; Santiago & Roxas, 2015; Shrestha et al., 2020; Kammar et al., 2017; Calub et al., 2019; Rosales, 2019). Additionally, one study specifically examined kindergarten settings (Davis et al., 2015).

The reviewed literature primarily focused on students and youth as participants in these programs. However, six studies included teachers, while three others involved parents, caregivers, and mothers as respondents. The inclusion of various stakeholders highlights the collaborative nature of agricultural activities, which can enhance their effectiveness when implemented in schools. Calub et al. (2019) emphasized this in their study of the School-Plus-Home Gardens Project (S+HGP), which was a collaboration between the South Regional Center for Graduate Study and Research in Agriculture (SEARCA), the University of the Philippines Los Baños, and the Department of Education in Laguna, Philippines. This initiative improved upon the existing *Gulayan sa Paaralan* program by encouraging parent involvement to bridge school-based agricultural activities with home practices, thus promoting better nutritional and agricultural outcomes (Oro et al., 2018).

The importance of teachers' knowledge and skills in integrating agricultural concepts into their teaching was also underscored. Studies highlighted the need for teachers to possess strong content knowledge and effective pedagogical techniques to maximize the impact of agricultural programs (Ndwandwe et al., 2014; Hemmelgarn et al., 2019; Ruamchiplee, 2020).

In terms of geographical distribution, Asia was the most frequently studied region, with 15 studies included in the review. Africa followed with four studies, while five studies were conducted in developed nations, including Australia, the United States, and Canada. This distribution reflects the global interest in school-based agricultural programs, particularly in regions where agriculture plays a significant role in food security and community development.

Table 1: Summary of studies reviewed on the Agricultural activities implemented in secondary schools

Literature	Respondents	Locale of the study	Identified Agricultural Activities
Guitart et al., 2014	Students	Australia	garden
Davis et al., 2015	Students	USA and Australia	school garden
Beery et al., 2014	Children	South Africa	garden
J. A. Manalo et al., 2014	Youth	Philippines	Read, Surf and Text for Your Parents: A campaign to mobilize the youth as infomediaries
Molijon & De La Rama, 2014	Students	Philippines	*Gulayan sa Paaralan*/Vegetable Garden, Organic Vegetable Production
Ndwandwe et al., 2014	high school agriculture teachers	Swaziland, Africa	organizing and planning for lesson, command of the subject matter, classroom management, innovative teaching, method of instruction and assessment of agriculture curriculum
Saludez et al., 2014	Youth	Philippines	Rice garden in schools
Stubbs & Meyers, 2015	students and teachers	Florida, USA	agricultural education to increase student achievement in STEM
Santiago & Roxas, 2015	Students	Philippines	Family Framing Schools, SAKA program, Farm Business Schools, and the Social Enterprise approach of GAWAD Kalinga
Erismann et al., 2016	schoolchildren and their caregivers	Burkina Faso and Nepal	Vegetables go to School: Improving Nutrition through Agriculture Diversification, WASH intervention (water, sanitation, hygiene)
J. I. Manalo et al., 2016	Students	Philippines	Climate Smart Agriculture (CSA), Infomediary Campaign in 2014
J. A. Manalo et al., 2016	students, school officials	Philippines	Climate-smart Rice Agriculture (CSRA), youth as infomediaries
Cairns, 2017	Students	USA and Canada	school garden
Schreinemachers et al., 2017	school children	Bhutan	school gardening, combining gardening with education and promotion
Kammar et al., 2017	students and teachers	India	school nutrition garden, School garden kit distribution, World Environment day, group discussion

Literature	Respondents	Locale of the study	Identified Agricultural Activities
Everhardt et al., 2018	school-aged children	USA	gardening and nutritional activities
Waiganjo & Wawer, 2018	Students	Sub-Saharan Africa	Co-operative Learning Approach (CLA) in agriculture science
Hemmelgarn et al., 2019	teachers	USA	Integration of agroforestry content in HS agriculture programs using mixed method approach
Calub et al., 2019	students and parents	Philippines	School-P (Placeholder1)lus-Home Gardens Project (S+HGP), a collaboration of school and stakeholders
Oro et al., 2018	students and mothers	Philippines	Integrated School-based nutrition program included gardening, nutrition education for parents, and supplementary feeding for children (GarNESup)
Abella & Cutamora, 2019	students	Philippines	National Greening Program
Rosales, 2019	school heads and teachers	Philippines	*Gulayan sa Paaralan* Program (GPP)
Ruamchiplee, 2020	teachers	Thailand	Agriculture Education
Njura et al., 2020	-	Kenya	Conceptual framework for Agriculture classes
Shrestha et al., 2020	students	Nepal	school garden program and WASH intervention, nutrition and health components of the program

3.2 Classification of Agricultural Programs/Activities implemented

Table 2 presents the classifications of agricultural programs and activities implemented, as discussed in the reviewed literature. The most widely implemented initiatives were school gardens and their associated integrated activities. In the Philippines, school gardens are known as *Gulayan sa Paaralan*, a national program led by the Department of Education in partnership with the Department of Agriculture. These gardens primarily focus on cultivating vegetables, although Saludez et al. (2014) highlighted the inclusion of rice cultivation in some school gardens. Similarly, in other countries, school or vegetable gardens were established at secondary schools as a way to teach agricultural practices and improve nutrition.

Integrated agricultural programs, which combine school gardening with additional components, were identified in eight studies. These programs often included garden kit distribution, nutritional activities, the integration of agriculture into educational curricula, and the involvement of parents and caregivers. A strong connection between nutrition and agriculture was emphasized in these integrated activities. For example, Shrestha et al. (2020) and Erismann et al. (2016) highlighted sanitation-focused programs like Water, Sanitation, and Hygiene (WASH), which were incorporated into agricultural initiatives. Feeding programs linked to school gardens also emerged as a key aspect of these integrated activities. Furthermore, collaboration between schools and stakeholders, including local organizations and communities, was a recurring theme in the reviewed studies (Calub et al., 2019; Kammar et al., 2017; Santiago & Roxas, 2015).

The integration of agricultural content into education was discussed in six studies, covering a variety of subject areas. Examples include Science, Technology, Engineering, and Mathematics (STEM) (Stubbs & Meyers, 2015), Agricultural Entrepreneurship (Santiago & Roxas, 2015), Agriculture Science (Waiganjo & Wawer, 2018), and Agroforestry (Hemmelgarn et al., 2019). Other studies explored innovative teaching approaches and methods to enhance agricultural education (Njura et al., 2020; Ndwandwe et al., 2014).

Lastly, three studies focused on information dissemination activities. These initiatives frequently used technology to bring agricultural knowledge into homes and communities. High school students were particularly effective in these activities due to their stronger communication skills compared to elementary students. Through technology, these programs not only improved awareness of agriculture but also encouraged broader community engagement.

Table 2. Classification of Agricultural Programs/Activities Implemented

Classification	Frequency
School Garden	8
Integrated activities (garden, garden kit distribution, nutritional activities, integration of agriculture in education, parents' education on agriculture/nutrition)	8
Agriculture integration in the curriculum and teaching innovations	6

Information dissemination, infomediaries (through technology)	3

3.3 Areas of interest of reviewed studies

Table 3 presents the areas of interest identified in the reviewed literature, which were grouped into themes based on the focus of the studies. These themes were frequently mentioned across multiple studies, which increased their frequency count.

Health and nutrition emerged as the most commonly discussed theme, with a frequency count of 21. This indicates that secondary schools often implement agricultural activities with the primary goal of improving the health and nutrition of students. Some studies also highlighted the involvement of parents and caregivers in these programs, emphasizing the role of agriculture in promoting family and community well-being (Calub et al., 2019; Oro et al., 2018). School-based programs such as vegetable gardens and nutrition-focused interventions have demonstrated their potential in addressing malnutrition and dietary deficiencies among school-aged children (Shrestha et al., 2020; Erismann et al., 2016).

Food security, teaching, and environment were equally prominent themes, each with a frequency count of 7. In the context of food security, several studies discussed topics such as organic agriculture and sustainable farming practices, often linked to school gardening activities (Molijon & De La Rama, 2014; Santiago & Roxas, 2015). The integration of agricultural education into the school curriculum was also a significant focus, as it provides opportunities for students to learn practical skills and foster a deeper understanding of food systems (Stubbs & Meyers, 2015; Waiganjo & Wawer, 2018).

The theme of the environment included topics such as climate change, disaster mitigation, solid waste management, and environmental sustainability. These areas highlight the close relationship between agricultural practices and environmental conservation, emphasizing the need to incorporate sustainable practices into school programs to raise awareness among students about ecological stewardship (Njura et al., 2020; Hemmelgarn et al., 2019).

Learning and ICT (Information and Communication Technology) appeared as a theme with a frequency count of 6. This underscores the role of ICT in enhancing agricultural education, especially among youth who are increasingly engaged with technology. Through digital platforms and tools, students can disseminate agricultural knowledge to their families and communities, expanding the reach and impact of these programs (Ndwandwe et al., 2014; Ruamchiplee, 2020). ICT also provides innovative ways to make agriculture more appealing to the younger generation, addressing the declining interest in farming as a profession (Shrestha et al., 2020; Rosales, 2019).

These findings demonstrate that agricultural activities in secondary schools are multifaceted, addressing critical areas such as health, food security, education, environmental sustainability, and technological integration. By focusing on these themes, schools can play a significant role in equipping students with the knowledge and skills needed to tackle global challenges.

Table 3. Areas of interest of reviewed studies

Areas of Interest of Studies	Themes	Frequency
Health, nutrition, diet, water, sanitation, food, nutrients	Health and nutrition	21
Food security, organic agriculture	Food security	7
Teaching, curriculum, approaches	Teaching	7
Climate change, disaster mitigation, solid waste management, environmental sustainability	Environment	7
Education of students and values of love and appreciation to agriculture	Learning	6
Media, ICT, technology, infomediaries, engagement	ICT	6

4. Conclusion and Recommendations

The studies reviewed show that agricultural programs and activities in secondary schools are important in addressing issues like food security, health and nutrition, environmental care, and education. Programs like school gardens, such as the *Gulayan sa Paaralan* in the Philippines, have proven to be effective in teaching students practical farming skills, improving their nutrition, and raising awareness about protecting the environment. Key themes identified in the studies include health and nutrition, food security, teaching integration, environmental sustainability, and the use of technology in agriculture.

Involving different stakeholders, like teachers, parents, and communities, has been shown to make these programs more effective. Collaboration with organizations outside schools also strengthens the success of agricultural activities. Additionally, including agriculture in school lessons helps students learn useful skills and better understand its importance. However, fewer young people are showing interest in agriculture, which remains a big concern. This calls for new ways to make farming more interesting, such as using technology and giving students hands-on experience.

It recommended that schools may work more closely with parents, communities, and local organizations when planning and running agricultural activities. This will help connect what students learn in school with practices at home. Adding agriculture to regular lessons, especially in subjects like Science and Math, can show students how farming relates to solving real-world problems. Teachers should also be given training to help them teach agricultural topics in fun and meaningful ways.

Using technology like apps, videos, and online tools can make learning about farming more engaging for students and their families. Schools may use these tools to spread information and encourage more people to participate in agricultural activities. Partnerships with universities and agricultural institutions can also bring new ideas and technologies to schools, giving students access to modern farming techniques.

References

Abella, R. C., & Cutamora, J. C. (2019). An evaluation of the National Greening Program implementation in Simala, Cebu Philippines utilizing ABCD model. European Scientific Journal ESJ, 15(10). https://doi.org/10.19044/esj.2019.v15n10p168

Badger, D., Nursten, J., Williams, P., & Woodward, M. (2000). Systematic reviewing: A new initiative in social work? British Journal of Social Work, 30(6), 739–754. https://doi.org/10.1093/bjsw/30.6.739

Beery, M., Adatia, R., Segantin, O., & Skaer, C. F. (2014). School food gardens: Fertile ground for education. Health Education, 114(4), 281–292. https://doi.org/10.1108/HE-05-2013-0019

Cairns, K. (2017). Connecting to food: Cultivating children in the school garden. Children's Geographies, 15(3), 304–318. https://doi.org/10.1080/14733285.2016.1221058

Calub, B. M., Africa, L. S., Burgos, B. M., Custodio, H. M., ShunNan, C., Vallez, A. G. C., Galang, E. I. N. E., & Punto, M. K. R. (2019). The School-Plus-Home Gardens Project in the Philippines: A participatory and inclusive model for sustainable development. Policy Brief Series - Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), 1, 12 pp. https://www.searca.org/knowledge-resources/1603-pre-download?pid=430

Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. SAGE Publications.

Davis, J. N., Spaniol, M. R., & Somerset, S. (2015). Sustenance and sustainability: Maximizing the impact of school gardens on health outcomes. Public Health Nutrition, 18(13), 2358–2367. https://doi.org/10.1017/S1368980015000221

Erismann, S., Shrestha, A., Diagbouga, S., Knoblauch, A., Gerold, J., Herz, R., Sharma, S., Schindler, C., Odermatt, P., Drescher, A., Yang, R. Y., Utzinger, J., & Cissé, G. (2016). Complementary school garden, nutrition, water, sanitation, and hygiene interventions to improve children's nutrition and health status in Burkina Faso and Nepal: A study protocol. BMC Public Health, 16(1), 1–11. https://doi.org/10.1186/s12889-016-2910-7

Everhardt, S. L., Gill, B. I., Cellon, J., & Bradley, C. (2018). School gardens: Unpacking the potential to reduce food insecurity among Alabama's children. Research in Political Sociology, 25, 97–118. https://doi.org/10.1108/S0895-993520180000025005

Food and Agriculture Organization (FAO). (2019). The state of food and agriculture 2019: Moving forward on food loss and waste reduction. FAO. https://doi.org/10.4060/ca6030en

Guitart, D. A., Pickering, C. M., & Byrne, J. A. (2014). Color me healthy: Food diversity in school community gardens in two rapidly urbanising Australian cities. Health and Place, 26(November 2013), 110–117. https://doi.org/10.1016/j.healthplace.2013.12.014

Hemmelgarn, H., Gold, M., & Ball, A. (2019). Agroforestry education for high school agriculture science: An evaluation of novel content adoption following educator professional development programs. Agroforestry Systems, 93(1), 1659–1671. https://doi.org/10.1007/s10457-018-0278-7

Kammar, M., Biradar, A., Angadi, S., & Vidyavathi, G. (2017). Impact of school nutrition garden on the nutrient intake of children. Asian Journal of Agricultural Extension, Economics & Sociology, 18(2), 1–6. https://doi.org/10.9734/ajaees/2017/34018

Manalo, J. A., Balmeo, K. P., Berto, J. C., Saludez, F. M., Villaflor, J. D., & Pagdanganan, A. M. (2016). Integrating climate-smart rice agriculture into secondary-level curriculum: Lessons from three high schools in the Philippines. SpringerPlus, 5(1). https://doi.org/10.1186/s40064-016-3238-6

Manalo, J. A., Balmeo, K. P., Domingo, O., & Saludez, F. (2014). Young allies of agriculture extension: The Infomediary campaign in Aurora, Philippines. Philippine Journal of Crop Science, 38(1), 30–40.

Manalo, J. I., Saludez, F., Layaoen, M., Pagdanganan, A., Berto, J., Frediles, C., Balmeo, K., & Villaflor, J. (2016). Climate-smart agriculture: Do young people care? Asian Journal of Agriculture and Development, 13(1), 5–5. https://doi.org/10.13140/RG.2.2.29943.27046

Molijon, A. L., & De La Rama, J. M. (2014). Baseline assessment of the vegetable gardens (Gulayan sa Paaralan) in public elementary and secondary schools. JPAIR Institutional Research, 4(1), 64–75. https://doi.org/10.7719/irj.v4i1.307

Ndwandwe, S. B., Barnabas, M., & Dlamini, M. (2014). A descriptive study of high school agriculture teachers' competencies in Swaziland. North American Colleges and Teachers of Agriculture Journal, June, 88–94.

Njura, H. J., Kaberia, I. K., & Taaliu, S. T. (2020). Teaching secondary school agriculture at the psychomotor domain: A conceptual framework for enhanced skills development for food security. Journal of Agricultural Education and Extension, 0(0), 1–21. https://doi.org/10.1080/1389224X.2020.1816479

Oro, E., Agdeppa, I., Baguilat, I., & Al., E. (2018). Improving food and nutrition security in the Philippines through school interventions.

Rosales, C. M. (2019). Implementation of Gulayan sa Paaralan program in all public schools in San Nicolas District. International Journal of Research in Engineering, Science and Management, 2(7), 255–259.

Ruamchiplee, T. et al. (2020). Development strategies for increasing agricultural teacher competency in rural Thai secondary schools. Revista Espacios, 41(4), 7.

Saludez, F. M., Domingo, O. B., Balmeo, K. P., & Manalo, J. A. (2014). Planting rice is full of fun!: Rice garden as a tool to promote appreciation of rice farming in secondary schools. Philippine Journal of Crop Science, 1, 114.

Santiago, A., & Roxas, F. (2015). Reviving farming interest in the Philippines through agricultural entrepreneurship education. Journal of Agriculture, Food Systems, and Community Development, 5(4), 1–13. https://doi.org/10.5304/jafscd.2015.054.016

Schreinemachers, P., Rai, B. B., Dorji, D., Chen, H. pu, Dukpa, T., Thinley, N., Sherpa, P. L., & Yang, R. Y. (2017). School gardening in Bhutan: Evaluating outcomes and impact. Food Security, 9(3), 635–648. https://doi.org/10.1007/s12571-017-0673-3

Shrestha, A., Schindler, C., Odermatt, P., Gerold, J., Erismann, S., Sharma, S., Koju, R., Utzinger, J., & Cissé, G. (2020). Nutritional and health status of children 15 months after integrated school garden, nutrition, and water, sanitation, and hygiene interventions: A cluster-randomized controlled trial in Nepal. BMC Public Health, 20(1), 1–19. https://doi.org/10.1186/s12889-019-8027-z

Stubbs, E. A., & Meyers, B. E. (2015). Multiple case study of STEM in school-based agricultural education. Journal of Agricultural Education, 56(2), 188–203. https://doi.org/10.5032/jae.2015.02188

United Nations. (2020). The state of food security and nutrition in the world 2020: Transforming food systems for affordable healthy diets. FAO. https://doi.org/10.4060/ca9692en

Waiganjo, M. M., & Wawer, B. N. (2018). Improving agricultural productivity through effective teaching of agriculture science to girls in secondary schools, Kenya. International Journal of Innovative Research and Advanced Studies (IJIRAS), 5(11).